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The Mildew Problem With Cotton and Wool Materials

An Account of the Action of Bacteria and Mildew on Various Textile Fibers in the Light of the Most Recent Investigations

By A. J. HALL, B.Sc., F.I.C., F.T.I.

UNTIL about eight years ago the importance of mildew attack of textile materials appears to have been but little realized so that recent investigators have found past textile literature to afford only slight assistance. Probably the last war was instrumental in drawing attention to this subject because it is under war-time conditions that fabrics are most subject to mildew and bacterial attack. But there can be no doubt, that even without the influence of the war, attention would soon have been turned to the discovery of methods for protecting textile materials for it is now widely recognized that in the near future fiberous materials are likely to find more new applications for industrial purposes than for the manufacture of clothing and furnishing fabrics. Everyone will realize that fabrics used in the construction of roads, tunnels, aeroplane wings, and motor tires and bodies must be made resistant to all attacks by mildew and bacteria.

The mildew problem has recently been tackled with energy and initiative by the research workers of the British Cotton Industry Research Association and the British Research Association for the Woollen and Worsted Industries, and much progress has been made. Very many interesting facts have come to light and most of these invite further investigations, while assisting in the avoiding of certain technical difficulties in the cotton and wool industries. In the case of cotton it is particularly gratifying to know that not only has the mildew problem been widely surveyed (a very large number of different mildew growths have been classified according to their attack on cotton) but that in Shirlan has been discovered an antiseptic which appears to be capable of protecting from mildew all kinds of cotton goods which contain starch sizes and are thus very prone to mildew attack.

The mildews (mould fungi) which are able to attack cotton and linen materials are those, or similar ones, such as are found growing on foodstuffs. Everyone is familiar with the greenish mould occasionally found on jam which has been improperly sealed or otherwise exposed to the air. Under a moderate magnification this particular mould is seen to have the interesting and somewhat pretty form depicted in Fig. 1. It consists of very slender threads

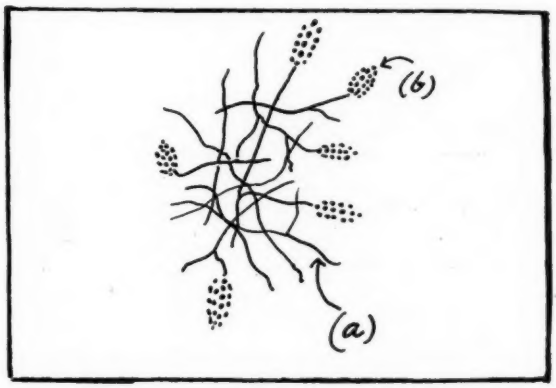

Fig. 1.
Penicillium showing hyphae (a) *and spores* (b)

(a) which grow rapidly, thereby forming a network known as a mycelium—the individual threads composing this mycelium are known as hyphae and have a thickness of a few ten-thousandths of an inch. At a definite stage in their growth the hyphae fruit in small tufts of spores (b) which are very easily detached; if these spores fall on a suitable nutrient medium they each commence to grow and so form another mould. A mildew is thus very much like an underwood growth in a forest and has all the usual characteristics of vegetable growth. Various types of mildew exist and they are classified according to

their character. The greenish mildew just described is not only found on jam; it is frequently found in cotton and there it is capable of doing much damage and is termed *Penicillium*.

The sources of infection of cotton goods with mildew may be many. The spores of mildew (from the plant and soil) are to be found in raw cotton. In its journey from the cotton fields to the spinning and weaving sheds there is ample opportunity for mildew spores of all kinds to drop upon it and grow rapidly as soon as the conditions favorable to growth exist. It is thus evident that since more exposure to air (mildew spores are always likely to be present in air) is a ready means of mildew infection, the only protective measures which can be taken consist of treating the cotton goods so that mildew cannot grow upon them. This implies the necessity for an examination of the conditions of growth of mildews such as are likely to infect cotton.

The structure of mildew (mould fungi) has already been indicated, but it is perhaps necessary to outline the growth of such mould fungi as far as it affects cotton or linen. The mycelium and spores of a mould fungus or mildew are, of course, derived from the substances on which the fungus lives; in the case of cotton these nutrient substances include particularly the starches and sugars which are present as size or finishing assistants, and even the cellulose itself. Since starch and cellulose are insoluble it is necessary for them to be solubilized before they can be assimilated by the fungus. Solubilization is brought about by the action of enzymes which naturally accompany the fungus. Thus, if the fungus is one which assimilates cellulose, then the cotton fiber rapidly loses strength while it supports the life of a mildew growing upon it. On the other hand, if the fungus lives on the starch present then the cotton may largely escape attack.

Considering now the growth of mildew on a white cotton material containing starch, various results may be noticed. In the first place, the decomposition products of the starch may be acid or alkaline. Mildews which most readily flourish on cotton goods usually produce acidity, and this may be detected by the ordinary indicators. In various cases examined by the writer, acidity, as produced by mildew in grey cotton fabric, has also been accompanied by a loss of strength of the cotton; whether the loss of strength was the direct result of the action of the acid on the cotton, or the result of acid being formed from the cotton it has not been possible to determine. L. D. Galloway (J. Text. Inst., 1930, 21, 277) in an excellent paper on this subject, finds that among the species of mildew capable of developing alkali (usually by assimilation of nitrogen impurities) are *Cladosporium* and *Aspergillus versicolor,* while *Aspergillus niger, Aspergillus terreus,* and *Aspergillus fumigatus* readily give rise to acidity.

Another result of mildew is the development of color patches on the cotton. This color is usually that of the spores of the mildew since an *Aspergillus* mycelium is always colorless. Some mildews are also capable of forming small round bodies (perithecia, not spores) which are colored; examples are: *Aspergillus repens* (bright yellow), and *Aspergillus nidulans* (yellow to brown). The *Aspergillus niger* is often to be recognized by the dark stains to which it gives rise—the spores are black. Stains produced by mildew in white cotton fabric may be much influenced by the various substances present. For example, Galloway records that in the presence of zinc (chloride of zinc is a well known antiseptic which is very frequently added to starch sizes for the purpose of restricting mildew growth) the brown stain produced by *Aspergillus terreus* is greatly intensified.

The area of fabric within a mildew growth has frequently a strong reducing action such as may be shown by its rapid decolorizing effect on a dilute solution of potassium permanganate. The mildewed cotton may also acquire a musty odor.

In the case of colored cotton materials it is evident that the effects produced by mildew will, to a certain extent, be dependent on the fastness of the dyes present. Discoloration will result according to how the dye is affected by acids or alkalis, and by reducing agents. An interesting description of the effect of mildew on black bordered dhooties where the dye resisted mildew has been given by Armstead and Harland (J. Text. Inst., 1923, 14, 475).

The occurrence of mildew in grey cotton piece goods is sometimes able to cause considerable trouble in the subsequent processes of dyeing if the mildew escapes unnoticed by the grey man. This has been experienced by the writer. Mildewed cotton fabric in the grey has been put into work, bleached and scoured in the normal manner, and then dyed with the result that pale patches have been produced in the dyeing with direct dyes. Such pale patches were traced to mildew patches in the grey fabric, and it was evident that the mildew had the effect of so affecting the cotton as to reduce its affinity for direct dyes. It is suggested in the case of mildewed grey fabric that a thorough kiering should not be omitted and that the fabric be mercerized before dyeing; either of these methods should give the mildewed parts their normal affinity for direct dyes.

So far, no details have been given of the various types of mildew found on cotton materials. It is not proposed to develop this point because of its complexity and because it is not altogether necessary for the cotton technologist to have a detailed knowledge. The complexity of the subject is indicated by the fact that systems for classifying and identifying mildews are not yet complete and also by mention of the collection of about 180 different mildew growths which have been made by the British Cotton Research Association. Readers desiring more information are recommended to refer to G. Smith (J. Text. Inst., 1928, 19, 93), Armstead and Harland (J. Text. Inst., 1923, 14, 157), Osborn (J. Soc. Dyers and Col., 1912, 28, 204), and T. B. Bright (J. Text. Inst., 1926, 17, 396). It is very useful to both dyers and finishers to be able to examine mildewed materials with sufficient accuracy to be able to compare and establish mildew infec-

tion, and this is really not a difficult matter if the following method is employed:

The method depends on the fact that under the conditions employed mildew spores and mycelium readily become stained with Cotton Blue while cotton itself remains colorless. Firstly, a lactophenol solution is prepared, having the following composition:

Lactic acid	1 part
Phenol	1 part
Glycerine	2 parts
Water	1 part

The mildewed cotton is then spotted with the above solution and warmed at about 50° C. for a few minutes whereby the cotton and mildew become completely impregnated with the solution. It is then immersed for a few minutes in a 1% solution of Cotton Blue (aqueous solution), removed, washed in water, and further rinsed with the above lactophenol solution until all loose color is removed. The cotton is then examined under a microscope when it is found that the mycelium (blue) is usually inter-twisted in the cotton yarn (colorless); the character of the colored fruiting hyphae can also be clearly seen. Usually the appearance of the mildew is so clear under these conditions that it is not difficult to identify it by reference to the appearance of various types of mildew as shown in standard works of reference on this subject.

For detailed examination of the mildew to be found in cotton it is necessary to transfer the mildew to a nutrient medium which favors its growth. A suitable medium (Norris: J. Text. Inst., 1927, 18, 103) is prepared by dissolving 4 grams of agar-agar in 190 c.c. of boiling water under slight pressure in an autoclave, filtering, and then adding a thin paste prepared by grinding 4 grams of flour or starch with 25 c.c. of water; after boiling for about 5 minutes whereby the total volume becomes reduced to 200 c.c. The product is then conveniently poured into small Petri dishes which are afterwards sterilized by heating in an autoclave. Mildew transferred to these dishes of nutrient medium will then grow so that they can be separated into their classes and examined further as desired.

To return to the mildewed cotton, it is desirable to be able to ascertain and perhaps measure the damage produced. How far is it possible to ascertain to what extent the individual cotton fibers have been attacked? At first one might consider that mildew attack of cotton would be readily revealed by the lowered viscosity of the cotton in cuprammonium solution since, so far as is known, this method always indicates a loss of tensile strength in cellulosic materials even when this loss is exceptionally small. But, strange to say, Searle (J. Text. Inst., 1929, 20, 162) has recently discovered that cotton may be badly tendered by attack with mildew and yet have a high viscosity. This discovery is of such extraordinary interest that some of Searle's results are given below:

Material	Loss of tensile strength due to mildew attack	Low viscosity in 1% cuprammonium solution
Linen:	0% (not attacked)	1.12
	95	1.10
	0% (not attacked)	1.20
	92	1.20
Cotton:	0% (not attacked)	1.44
	37	1.46
	60	1.50

There is thus no doubt that little reliance can be placed on the viscosity test for measurement of mildew attack. Apart, however, from actual strength measurement, there are two useful tests which are known as the Fleming and Thaysen swelling test (Biochem. J., 1920, 14, 25) and the Congo Red test (J. Text. Inst., 1926, 17, 396) which depend on the fact that in mildew attack the cuticle of the cotton is weakened or broken.

In the swelling test, the cotton is placed in a mixture of 15% caustic soda and carbon bisulphide, whereupon rapid swelling of the cotton fibers occurs. The swelling of a fiber whose cuticle has been damaged by mildew attack differs from that of a normal fiber in that with a normal fiber swelling continues until the cuticle is unable to restrain the inner cellulose and bursts, the fiber then taking the form of a tightly stretched cord on which are threaded beads, in the form of a corkscrew; with the attacked fiber, the cuticle having been weakened, is unable to restrain swelling and the inner cellulose gradually dissolves, showing ruptures in the fiber without the bead or corkscrew effect. If this process is carried out while under a moderate magnification, it is possible to count the damaged and non-damaged fibers and thus estimate the proportion attacked.

The Congo Red test is perhaps capable of more extended use than the swelling test of Fleming and Thaysen, and it is very simple to carry out. Three solutions are required—(1) an aqueous saturated solution of Congo Red (about 2%); (2) an 11% solution of caustic soda, and (3) an 18% solution of caustic soda. The damaged cotton fibers under examination are first uniformly wetted out in water, then squeezed, immersed for five minutes in the 11% caustic soda solution, washed in water, allowed to stand for six minutes in the Congo Red solution, washed with water until all loose color is removed, and then placed in the 18% solution of caustic soda; the red colored fibers, mounted in the same 18% alkali solution, are then examined under the microscope. It is found that all parts where the cuticle is damaged are stained much darker red than the other parts since it is at such parts that the inner cellulose protrudes through the weakened cuticle owing to the swelling caused by the strong alkali treatment.

It is obvious that there must be a certain amount of difficulty in investigating or testing in the laboratory the resistance of textile fabrics to attack by bacteria and mildew; normal conditions of attack are difficult to reproduce accurately in the laboratory. But it does appear

that the method of Searle (J. Text. Inst., 1929, 20, 163) is excellent in many respects. Briefly, Searle conducted his experiments as follows:

A suspension of a fertile black loam soil was prepared, 1 gram per 10 c.c., and allowed to settle for one minute. Then a Berkfeld filter candle, 8 x 1 inch, was immersed in the suspension and after attachment to the pump 100 c.c. of liquor was drawn through. In this manner the outside of the candle was covered with a thin layer of soil containing bacteria and various micro-organisms. Strips of wet cotton and linen fabric were then wrapped around the filter candle whilst connected to the pump, the fabric being thereby drawn uniformly close to the soil film. After detachment from the pump the candle was suspended within a larger tube containing a small quantity of water. In each tube was also placed a small control roll of the fabric being tested, impregnated with an 0.7% aqueous solution of mercuric chloride (a satisfactory antiseptic). The tubes were maintained at 30° C. for definite periods of time and then the strips and the controls were thoroughly wetted and broken wet on a strength-testing machine.

Searle found that the attack of linen and cotton by micro-organisms proceeded similarly, the weft appearing to suffer a greater attack than the warp. Some idea of the rate of attack with the consequent loss of strength can be obtained from Fig. 2 and 3.

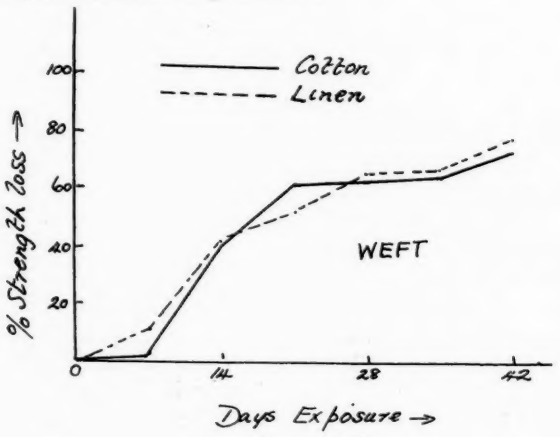

Fig. 2.

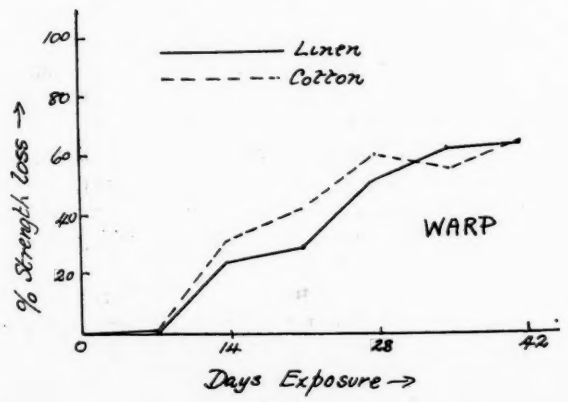

Fig. 3.

It will be noted that in Searle's method the fabrics are surrounded by an atmosphere saturated with moisture. This is because it has been ascertained by numerous workers, and it is also the experience in the trade, that cotton is only liable to attack by micro-organisms, particularly mildew, in the presence of a maximum amount of moisture. Armstead and Harland (J. Text. Inst., 1923, 14, 475), for instance, record the following results relating to the growth of Aspergillus on cotton fabrics of various moisture contents:

Relative humidity of surrounding atmosphere	Moisture content of fabric	Nature of mildew growth
100%	15.5%	Profuse (after 14 days)
98	14.8	Profuse (after 14 days)
96	12.8	Very little (6 weeks)
94	14.8	Profuse (6 weeks)
92	7.8	Moderate growth (9 weeks)
90	7.0	None (after 4 months)

It appears that mildew growth is not likely to occur unless cotton contains not less than about 7.0% of moisture.

Returning now to the efforts of the British Cotton Industry Research Association to find a satisfactory substance which will prevent the growth of mildew in cotton goods (especially sized cotton goods) even under conditions which would normally favor such growth, attention may be drawn to a very interesting paper on this subject by Fargher, Galloway, and Probert (J. Text. Inst., 1930, 21, 245). In this paper the main lines of research leading to the discovery of Shirlan are outlined. It had already been shown by Morris (J. Text. Inst., 1927, 18, 99) that three compounds of exceptional toxicity were—thallium carbonate, para-nitrophenol, and 2:4:6-trichlorophenol. The first of these is an excellent antiseptic in many ways, but its supplies are limited and its price high. Para-nitrophenol is both cheap and highly toxic, but develops an objectionable yellow color under neutral or alkaline conditions, while the third of these compounds is pungent and volatile.

Efforts to modify para-nitrophenol and so overcome the color disadvantage were not successful; on acetylation, the toxicity was reduced to one-half and though the color was less pronounced, it was still sufficiently objectionable to preclude its general use. Attention was then turned to acetanilide (among other compounds) which proved to be about half as toxic as phenol. By introduction of substituant groups this toxicity was slightly lowered with ortho- or para-methyl, para-chlorine and para-nitro groups, and markedly lowered with para-hydroxyl and N-methyl groups. The toxicities of acet-beta-naphthylamide and 8-acetylaminoquinoline were found to be similar to that of acetanilide itself. On the other hand, acet-alpha-naphthylamide, 5-acetylaminoquinoline and 2-acetylaminopyridine are relatively non-toxic. It was then found that combination of aniline with salicylic acid led to a substance of definite promise—salicylanilide. Eventually this substance was considered to be the most satisfactory

of all the compounds investigated and it is now being marketed under the name of Shirlan.

Salicylanilide is sparingly soluble in water—100 grams of water dissolves about 0.005 grams at 25° C., and only 0.08 grams of the substance at 100° C. Nevertheless, in a concentration of but 0.005% it shows good antiseptic properties. Salicylanilide gives no color with ferric chloride in aqueous solution, but alcoholic ferric chloride produces a violet color which fades very slowly if the alcohol is free from water, but rapidly if it contains more than 2% of water. The sodium salt crystallizes with four molecules of water and is much more soluble—100 grams of water dissolves 31.7 grams of the crystals.

Shirlan must, therefore, be considered the most satisfactory of all the substances now available for use in cotton materials and should eventually displace zinc chloride which for so many years has been used and considered as the safest antiseptic to employ. Among the advantages which it possesses may be noted its lack of volatility, its inertness to heat and metals, its absence of odor and color, and the fact that it does not react with cotton or a large number of such dyes as are usually applied to this fiber.

Analytical Methods for Textile Soaps

By **BENJAMIN LEVITT, F.A.I.C.**

BECAUSE there seems to be a paucity of knowledge as to the proper way of handling analyses of soap in a good many textile laboratories, we are here publishing methods which the writer has used during his 18 years' experience as analytical and research chemist for several of the largest soap manufacturing concerns in this country. During this period, it has been our pleasure to check the results obtained by these methods, with many of the largest consulting laboratories, and we have found them satisfactory in every respect.

Though these methods are not original nor new, we shall from time to time give notes and interpretations, factors and logarithms, which are usually omitted in text books, and which will help the analyst who tests soap infrequently.

The textile laboratory will ordinarily be concerned with sulfur olive oil soap, both hard and soft (fig soap). The chemist will be interested to know whether the soaps purchased by his firm meet with the guarantee of the manufacturer, as to perfect saponification, neutrality, freedom from loaders, and whether they are made of pure sulfur olive oil. Tallow and palm soaps are very often met with, as also red oil or oleic acid soaps, and products made with tallow or other hard fat combined with cocoanut oil.

Sampling

The government, in making its analysis of bar soap, prescribes that the bar shall be cut obliquely and that the sample shall be shaved off in small chips, taking a proportionate part of the outer section. It is also suggested that the whole bar be put through a meat chopper so as to get a uniform sample. This makes a rather messy job, which is impractical for the busy man. Our practice has been to cut off about a half pound, one inch or more from the end of a four-pound bar, then after cutting off the outer dry edge, to take from the interior, the various samples for analysis. In the case of chips or powder a grab sample from the center of the barrel should be representative.

Moisture

Weigh approximately 3 grams, into a crystallizing dish 35 x 60 mm. and dry in oven at 105° C. for four hours for bar soap, and two hours for chip or powdered soap. Cool in desiccator and weigh. I always make this test in duplicate for bar or fig soaps.

Free Caustic

Weigh out exactly 5 grams in a tared evaporating dish about 2½ inches in diameter, wash into 300 cc. tall form beaker with lip, with neutral alcohol and dissolve on the steam bath using about 150 cc. alcohol containing phenolphthalein as indicator. Filter with suction, and titrate filtrate with normal H_2SO_4. cc. x 0.04 x 20 = % Na OH. or for fig soap cc. x 0.056 x 20 = % KOH.

Carbonate

The residue on the filter is dissolved with hot water and when cool, titrate with normal H_2SO_4 using Methyl Orange as indicator. cc. x 0.053 x 20 = % sodium carbonate. In fig soap cc. x 0.0691 x 20 = % potassium carbonate.

If the soap contains no fillers, the above are the only free alkalies that will ordinarily be encountered. If fillers are suspected, it is always best to make a qualitative test for sodium silicate.

Qualitative Test for Sodium Silicate

Dissolve about 1 gram of the sample in 25 cc. of water. Note: Heavily silicated soaps may show a turbidity on account of some of the silicate having become dry and insoluble, especially is this true in the case of chips. There may also be some insoluble fillers such as silex, though these are now rare in textile soap. Starch or dextrine may also be present. In the absence of starch or dextrine, take 10 cc. of the clear solution and pour it into a test tube containing 10 cc. of acetone and 1 cc. of a solution made by dissolving 10 grams of pure sodium aluminate and 2 grams of sodium chloride in a liter of water. A flocculent gelatinous precipitate indicates sodium silicate. Note: In the case of very small amounts of silicate, as is sometimes present in toilet soap, the test tube contain-

ing the sample with the reagent may be heated in the steam bath for a minute, when a light flocculent precipitate comes down if silicate is present. This is a very ingenious test which was published in the Journal of Industrial and Engineering Chemistry about 1915.

Quantitative Determination of Sodium Silicate

Ash 1 gram of soap in a platinum crucible. Dissolve ash with hot water, and transfer to 300 cc. beaker. Acidify with concentrated HCl, and add a few drops of conc. HNO_3. Evaporate to dryness, and heat on the hot plate at about 130° C. for 1 hour. Pick up silicate residue with hot water, again acidify as before and wash down anything that may have spattered on the sides of the beaker, using a policeman. Evaporate and heat as before. Add water and a little HCl and filter through ashless filter paper. Incinerate in platinum crucible. Heat until all traces of carbon have disappeared and the SiO_2 is perfectly white. SiO_2 x 1.2571 x 100 = % sodium silicate ($Na_2Si_4O_9$) Log. Factor 0.09937.

Total Alkali and Total Fat

Five grams soap is dissolved in hot water, add 25 cc. normal H_2SO_4 and set on steam bath until the clear fatty acids float on top. Cool and transfer to pear shaped separatory funnel with U.S.P. ether. Wait about 5 minutes for the dissolved fatty acids to come to the surface, and draw off the acid water to another separatory funnel. Wash fatty acids with cold distilled water and add washings to liquor in other funnel. Shake acid washings with about 25 cc. ether, allow to stand about ten minutes, draw off aqueous liquor, and wash second ether extract with cold water as before, draw off water and combine with remainder of liquor. Filter the two ether extracts through dry filter into 150 cc. Soxhlet Flask, being careful to wash down the filter paper with ether in order to get all the fat. Distill off the ether, and dry the fatty acids on the steam bath. Note: some authorities direct that the fatty acids should be dried at 105° C., but in that case there is a possibility of volatilizing the lighter fatty acids, and so give low results. Fat x 20 = Total Fat.

The combined aqueous solutions are titrated with normal NaOH using methyl orange indicator.

25 cc. — NaOH titration x 0.031 x 20 = % total Na_2O. This includes free caustic, sodium carbonate, sodium silicate, if any, all of which must be subtracted to find combined Na_2O.

Factor Sod. Silicate to Na_2O	0.20448	Log. 9.31066
Sod. Carbonate to Na_2O	0.5849	Log. 9.76708
Sod. Hydroxide to Na_2O	0.775	Log. 9.88930

Sodium Chloride

To the aqueous solution of the total alkali, add a few drops of 10% Potassium Chromate and titrate with N/10 Silver Nitrate. Titration x 0.00585 x 20 = % salt.

Unsaponifiable

Five grams soap are dissolved in 50 cc. hot water, cool and add 50 cc. alcohol. Transfer to separatory funnel and shake with 50 cc. petroleum ether. Draw off alcohol layer into second separatory funnel and wash first extract with 25 cc. 50% alcohol. Draw off washings into second funnel and shake with 25 cc. petroleum ether. Draw off alcohol, wash extract as before and filter both extracts into 150 cc. Soxhlet Flask and distill off. Dry residue on steam bath. Extract x 20 = % unsaponifiable.

Calculation

Total Fat less unsaponifiable x 0.97 = Fatty Anhydrides. Fatty Anhydrides + Combined Na_2O = Anhydrous Soap. Note: In case of heavily silicated soap, the carbonate should be determined by evolution and absorption in potash bulbs or such apparatus. When the carbonate, silicate and free caustic are subtracted from the total Na_2O there may be more alkali left than is necessary for the saponification of the fatty acids. The actual combined alkali in that case should be determined by distilling off the alcoholic filtrate from the free caustic determination, then breaking up the soap with normal acid and after extracting the fatty acids as in total fat determination, titrating for combined alkali. The excess alkali, spoken of above, is calculated to Na_2O. This represents caustic soda which has been added to the soap while in the crutcher, in order to prevent the large amount of silicate from separating out before the soap gets cold. This will occur only in bar soap or that which is sold in barrels.

The analysis should total from 99.5 to 100%. There is always some glycerine in every soap. That which is made of olive foots will have very little. On the other hand tallow and cocoanut oil soaps may have considerable. If the sum of all the ingredients still lacks 1 or 2% to make 100%, then glycerine should be determined.

Glycerine

Weigh 20 grams bar soap or 15 grams chips or powder, dissolve in 100 cc. water, add sufficient H_2SO_4 to separate the fatty acids, heat on steam bath until the fatty acids are clear. Cool, and filter into 250 cc. volumetric flask, neutralize with NaOH and add basic lead acetate, rotating the flask after each addition, until no further precipitate forms. Fill to mark, and take aliquot of 25 cc. into 300 cc. Erlenmeyer Flask. Add a few cc. of dilute H_2SO_4 to precipitate the lead salts, and exactly 2 grams of C. P. potassium bichromate. Add 50 cc. water, and 50 cc. 1:1 H_2SO_4, cover with small beaker and set in steam bath for 2 hours. Cool and titrate with standard ferrous ammonium sulfate, running a blank on 2 grams of bichromate in order to determine strength of the sulfate in terms of bichromate. Powdered ferrous ammonium sulfate may be added directly to the Erlenmeyer Flask to slight excess, titrating back with a 1% solution of bichromate. A freshly prepared solution of potassium ferricyanide 0.1% is used as indicator on a drop plate. 1 gram bichromate = 0.13411 grams glycerol. Log. factor bichromate to glycerol 9.12746.

FIG SOAPS

Moisture

Weigh approximately 3 grams in a crystallizing dish 35 x 60 mm. and dry in oven at 105° C. for three hours, cool in desiccator and with a spatula break up the fused

mass, being careful not to spill any fragments. This is to insure against the occlusion of the last traces of moisture. Dry in oven one hour, cool in desiccator, weigh and calculate loss as moisture.

Free Caustic Potash and Potassium Carbonate

Determined as in hard soaps—1 cc. $N/H_2SO_4 = 0.056$ gram KOH Log. 8.74902; 1 cc. $N/H_2SO_4 = 0.0691$ gram K_2CO_3 Log. 8.83948.

Total Alkali

Determined as in hard soaps and calculated to K_2O. 1 cc. $N/H_2SO_4 = 0.0471$ gram K_2O Log. 8.67302.

Because fig soaps are made by the half boiled process, what little impurities there may be in the original oil of which they are composed, remains in the soap. This makes the soap somewhat cloudy, and the analyst may want to determine how much there is of it.

Impurities Insoluble in Water

Dissolve 5 grams in 150 cc. distilled water, and filter with suction using a weighted filter paper. Use platinum filter cone to prevent breakage of filter. Dry in oven at 105° C. Cool in desiccator, and weigh. Gain x 20 is per cent impurities.

Occasionally, a manufacturer in order to give the soap a stiffer body, may substitute part caustic soda, instead of making it entirely of potash. In such a case it may be desirable to determine potash quantitatively. The writer has also come across so-called fig soaps which he found to be soft only by virtue of the excessive amount of water which they contain. They were really dilute soda soaps. Hence, it seems advisable in analyzing an unknown soap to make a qualitative test for potash before proceeding further.

Qualitative Test for Potash

Incinerate 1 gram soap, leach the ash with 10 cc. water, neutralize with acetic or hydrochloric acid and add a 10 per cent solution of sodium cobaltinitrite. A yellow precipitate on slight warming indicates potash.

Quantitative Determination of Potash

The cheapest and easier method is the perchlorate method. Incinerate 3 grams of soap, dissolve in water, and titrate, using Methyl Orange, with N/HC1. Add 5 cc. of 10 per cent BaC1 to precipitate sulfates and filter. Evaporate on a hot plate to dryness. Dissolve in hot water and add 5 cc. of the 20 per cent Perchloric acid. Evaporate on the hot plate until dense fumes begin to come off, in order to make sure that all salts have been converted to perchlorates. Add 25 cc. 95 per cent alcohol saturated with potassium perchlorate containing about 0.2 per cent perchloric acid. Break up crystals with stirring rod, and let stand a half hour to insure solution of all perchlorates except $KC10_4$. (This determination depends upon the insolubility of $KC10_4$ in alcohol). Filter through Gooch crucible, wash precipitate four times by decantation, with 25 cc. portions of an alcoholic mixture as used above. Allow to stand a few minutes between each washing. Transfer precipitate to crucible and wash two times with 10 cc. portions of the alcohol solution and ether 1:1. Dry in oven at 120 to 130° C. and weigh. Dissolve $KC10_4$ on crucible with hot water, dry and weigh again. Loss in weight is $KC10_4$. Multiply by 100 and divide by $3 = \%$ $KC10_4$.

Factor $KC10_4$ to K_2O=0.3399 Log. 9.53138
KOH to K_2O=0.8394 Log. 9.92398
K_2CO_3 to K_2O=0.6816 Log. 9.83354
KC1 to K_2O=0.6317 Log. 9.80051

Calculation

If the total K_2O found gravimetrically minus K_2O represented by chlorides is equal to the K_2O found by titration, the soap is made entirely with potash. If it is less, subtract from the total K_2O by titration, the K_2O determined gravimetrically minus K_2O as chlorides. The difference is recalculated to Na_2O.

EXAMINATION OF THE FATTY ACIDS

Preparation

Dissolve four ounces of soap in an eight inch evaporating dish. Add 50 per cent sulfuric acid slowly to decompose the soap. Heat slowly until the clear fatty acids float on the surface. Cool and siphon off the acid water. Transfer the fatty acids to a 100 cc. tall form beaker. Set on steam bath until all traces of water have settled. Filter through dry filter paper into a second beaker.

Of all the tests that can be made for the identification of the fat the most important are Titer, Iodine Value and Saponification Number.

Titer

This denotes the heat of crystallization of the fatty acids under definitely standardized conditions.

Procedure

Transfer the clear fatty acids to a one ounce vial that is fitted into the neck of a one pound salt jar by means of a cork gasket. When the fatty acid has cooled somewhat stir with a thermometer graduated in 1-10th degree Centigrade and which is suspended over the vial with bulb dipping into the center of the fat. The temperature will gradually fall and then remain still for a while. Stop stirring and note slight rise in temperature. The highest point reached during this rise is called the Titer.

Iodine Value

By this is meant the percentage of Iodine that the fat absorbs or combines with, under definite conditions. It is a measure of the chemical unsaturation of the oil or fat and gives us valuable information as to its character. That is, a high Iodine value (130 to 190) indicates a drying oil; a lower value (95 to 125) indicates semi-drying oil. A value 50 to 90 indicates non-drying properties; 30 to 60 indicates a soft fat and a value 5 to 20 a very hard fat. Two exceptions to this rule are cocoanut oil (Iodine 8) and Palm Kernel Oil, which has a value of 13. These are not hard fats but they make very hard soda soaps. They consist chiefly of such saturated fatty acids as Capric, Lauric, Myristic and Palmitic.

The committee on Analysis of Commercial Fats and Oils of the American Chemical Society has adopted the Wijs Method for determining the Iodine Value.

Reagents

Wijs Iodine Solution. The method as finally adopted calls for 13 grams of re-sublimed iodine to be dissolved in 1 liter of glacial acetic acid 99 to 99.5 per cent strength and that dried chlorine gas be passed into the solution until the original titration of the solution is not quite doubled. The preparation of the gas is a considerable piece of work on which most chemists will not care to spend much time. This may be overcome by preparing the solution as follows:

1. Dissolve separately 7.9 grams iodine trichloride and 8.7 grams iodine in glacial acetic acid, on the water bath, taking care that the solutions do not absorb moisture. The solutions are then combined in a 1000 cc. volumetric flask cooled and filled to the mark with glacial acetic acid.

2. N/10 Sodium Thiosulfate Solution—Dissolve 24.8 g. of C. P. sodium thiosulfate (dry) and dilute with water to 1 liter at a temperature at which the titrations are to be made.

3. Starch Paste—Boil 1 g. Starch in 200 cc. of distilled water for ten minutes and cool to room temperature.

4. Potassium Iodine Solution—Dissolve 150 g. of KI in water and make up to 1 liter.

5. Potassium Bichromate—Dissolve 0.9658 g. C. P $K_2Cr_2O_7$ in water and make up to 250 cc. (This solution is equivalent to 9.01 g. Iodine per cc.)

Standardization of the Sodium Thiosulfate Solution—Place 25 cc. of the potassium bichromate solution to which has been added 10 cc. of the solution of KI, in a glass stoppered flask. Add to this 5 cc. of strong HC1. Dilute with 100 cc. of water and allow N/10 sodium thiosulfate to flow slowly into the flask until the yellow color of the liquid has almost disappeared. Add a few drops of the starch paste, and with constant shaking continue to add the N/10 thiosulfate until the blue color just disappears. Note the number of cc. required for the discharge of the color.

Determination

Weigh accurately from 1/10 to 5/10 g. (depending on the iodine number) of the melted or filtered sample into a clean dry 16 oz. glass stoppered bottle containing 10 cc. of carbon tetrachloride or chloroform. Add 25 cc. Iodine solution from a pipette, allowing to drain for a definite time. The excess of iodine should be from 50 to 60 per cent of the amount added, that is, from 100 to 150 per cent of the amount absorbed. Moisten the stopper with a 15% KI solution to prevent loss of iodine or chlorine but guard against an amount sufficient to run down inside of bottle. Let the bottle stand in a dark place for half hour at a uniform temperature. At the end of that time add 20 cc. of 15% potassium iodide solution and 100 cc. of distilled water. Titrate the iodine with N/10 sodium thiosulfate solution which is added gradually with constant shaking until the yellow color of the solution has almost disappeared. Add a few drops of starch paste and continue titration until the blue color has entirely disappeared. Toward the end of the reaction stopper the bottle and shake violently so that any iodine remaining in solution in the tetrachloride or chloroform may be taken up by the KI solution. Conduct two determinations on blanks which must be run in the same manner as the sample except that no fat is used in the blanks. Slight variations in the temperature quite appreciably affect the titer of the iodine solution, as acetic acid has a high coefficient of expansion. It is therefore essential that the blanks and determinations on the sample be made at the same time. The number of cc. of standard thiosulfate solution required by the blanks less the amount used in the determination gives the thiosulfate equivalent of the iodine absorbed by the amount of sample used in the determination. Calculate to centigrams of iodine absorbed by one gram of sample (equals per cent iodine absorbed).

Example: Suppose you took .2264 g. of Olive Oil for analysis.

Your blank runs.....27.65 cc.
Your back titration on sample .....17.45 cc.

10.20 cc. is the Thiosulfate equivalent on .2264 g. sample. Hence

$$\frac{10.2}{.2264} = \text{cc. of Thio. per g. of Olive Oil.}$$

But 25 cc. of Bichromate which represents .25 g. iodine gave a titration of 13.8 cc. thiosulfate. Therefore 1 g. iodine is equivalent to 13.8 x 4 or 55.2 cc. Hence $\frac{10.2}{.2264}$ divided by 55.2 x 100 equals per cent iodine absorption, which in this case is 81.62.

Saponification or Koettstorfer Number

By this is meant the number of milligrams of caustic potash required to saponify one gram of an oil or fat.

Reagents

N/2 Hydrochloric Acid carefully standardized.

Alcoholic Potash: Dissolve 40 grams of C. P. potassium hydroxide in a liter of 95 per cent redistilled alcohol. The alcohol should be redistilled from potassium hydroxide over which it has been standing for some time. The solution must be clear and the KOH free from carbonate.

Determination

Weigh accurately about 5 grams of the filtered sample into a 150 cc. Erlenmeyer Flask. Pipette 50 cc. alcoholic potash into the flask, allowing the pipette to drain a definite time. Connect flask with air condenser and boil until the fat is completely saponified (30 minutes). Cool and titrate with N/2 HC1, using Phenolphthalein as indicator. Calculate saponification number (mg. KOH required to saponify lg. fat). Conduct two blanks in the same manner.

Table of Constants for Oils and Fats that may be met with in the analysis of Textile Soaps.

Fat or Oil	Titer	Iodine Val.	Sapon. No.
Tallow	40° C	46-54	196
Coc. Oil	23	8	252
Palm Kern.	23	13	248
Sulfur Olive	18-22	80-85	211
Palm Oil	45	52	200
Red Oil (Oleic Acid)	10-30	85-90	196
Cotton Seed	35	112	194
Corn	20	120	188-193
Castor		85	185
Rape	12	94-102	170-179
Neatsfoot	16-26	62-77	200
Rosin	20	228	175-180

Rosin will seldom have to be determined because Rosin soaps are not used to a great extent in textile operations. However, since methods for soap analysis are incomplete without this, it may not be amiss to include it here.

Qualitative Test for Rosin—The Liebermann-Starch reaction is about the only test. Dissolve a small portion of the fatty acids in Acetic Anhydride. Add sulfuric acid sp. gr. 1.53 (17 cc. conc. H_2SO_4 to 19 cc. H_2O). In the presence of Rosin acids, a fugitive reddish violet color appears. This may be carried out on a dropping plate. The test is very sensitive.

QUANTITATIVE DETERMINATION OF ROSIN

Twitchell Method

Dissolve 3 grams of the dry fatty acids from the titer test, in 30 cc. absolute alcohol, in a large test tube, and pass dry hydrogen chloride gas through the solution in a moderate stream. The test tube is kept immersed in ice water during the esterification. Continue passing the gas until the esters separate and no more gas is absorbed. This usually requires 45 minutes. Let the test tube stand stoppered for a half hour to complete the reaction. Transfer to 300 cc. Erlenmeyer Flask, dilute with five times the volume of water and boil until the acid solution is clear and the esters containing the Rosin float on top. Transfer to separatory funnel and wash out the flask with 50 cc. petroleum ether. Run off the acid solution, wash petroleum ether once with water, treat with a solution of 0.5 gram KOH and 5 cc. alcohol in 50 cc. water and shake. The Rosin is thereby saponified and the two layers will separate. Draw off the lower Rosin Soap into another separatory funnel, acidify with dilute HCl and shake three times with ether. Wash combined extracts twice with water, filter ether extract into Soxhlet Flask. Distill off ether and dry Rosin acids at 100° C. and weigh. Calculate percentage in the total fatty matter of the original soap.

Interpretation of Results

Every buyer knows what he wants, so that it is comparatively easy by these methods, to check whether or not specifications have been carried out in every respect. The purchaser or chemist must remember that the soap-maker is dealing with natural products and that the color of Olive Soap, for instance, will not always be the same on each shipment. Color is no factor in the quality of such a commodity, for a pale oil which yields pale green soap may be equally as good as one made of dark green oil. It is important, however, whether genuine Sulfur Olive Oil has been used. Yet, certain purchasers request uniformity of color. It can only be supplied by artificial tinting of the soap. Such a specification is absurd.

In the case of Tallow soaps, the lighter color shows that better grade of Tallow has been used. That is, in the absence of fillers such as soda ash or silicate, which always improve the color of soap.

We have known certain purchasers to specify that the soap contains an excess of free alkali, even though they know well that they themselves can add the alkali to the processing solution at a saving. Their reason in such cases is that soap made in accordance with their unusual specification is fool-proof and so errors in their own plant are thereby eliminated. Such requirements can easily be complied with by the soap manufacturer.

Others require that the soap solution shall not become turbid at a certain temperature. This, we presume, is a simple method for determining quality and replaces in a way, the titer test.

Bibliography on Analytical Methods

Every laboratory should be equipped with the following books for reference:

Chemical Technology and Analysis of Oils, Fats and Waxes. By Lewkowitsch, MacMillan.

Technical Methods of Analysis. By Griffin, McGraw, Hill.

Official Methods of Chemical Analysis of the American Oil Chemists Society.

Van Nostrand's Chemical Annual.

Textile Soaps and Oils. By Hurst, Scott Greenwood.

Some Technical Methods of Testing Miscellaneous Supplies. U. S. Bureau of Standards.

DR. HERBERT H. DOW

Dr. Herbert H. Dow, President of the Dow Chemical Company and one of the country's outstanding chemical engineers and manufacturers, died at Rochester, Minn., October 15th.

Dr. Dow was graduated from the Case School of Applied Science in Cleveland in 1888. The following year he was professor of chemistry and toxicology at the Huron Street Hospital in Cleveland, and in 1889 he began manufacturing chemicals as an officer in the Midland Chemical Co., Inc. Later he organized the Dow Process Co., and the Dow Chemical Co., of which he was president and general manager.

More than a hundred patents have been taken out as a result of his investigations. This year he was presented with the Perkin Medal by the Society of Chemical Industry for the most valuable work of the year in applied chemistry.

The Evaluation of Turkey-Red Oils By Their Properties

By **H. POMERANZ**

Translated from Monatschrift fuer Textil-Industrie 45, 125 (1930)

IS A Turkey-red oil good or poor? In order to return an answer to that question, we had in former times first to learn the characteristics of a good product, and then to acquire a correct conception of their significance, in order to establish methods through which these characteristics could be determined and expressed numerically. In brief, there had to be devised a method of analysis for Turkey-red oil, similar to what had already been worked out for soaps, with which Turkey-red oil has much in common.

The analysis of a soap undertakes the task of quantitative determination of the most important constituents of the soap—the fatty substance, the alkali, and the water, the ratio of the fatty acid to the alkali (free alkali or free fatty acid), and finally—as far as analytic methods permit it—the character of the fatty acids which are the fundamental constituents of the soap.

A similar plan of analysis had to be devised for Turkey-red oil, but in this case the sulphuric acid combined with the fatty acids had also to be determined. The question of the nature of the fatty acids as the fundamental basis of the product did not possess any importance for, in practically all cases, the product would have been prepared from castor oil, and so the nature of these acids was already known.

Naturally, it was desirable to find out some relation between the analytical results and the behavior of the Turkey-red oil as an assistant in textile work; a desire which inspired very comprehensive researches upon Turkey-red oil, but which led to a result quite different from what had been expected. To be precise, it has been established that the dyeing industry requires only an acid soap, and that as a matter of fact the industry gets along perfectly well with an acid castor-oil soap—sulphonation for this purpose is entirely superfluous. The analytical work upon Turkey-red oil naturally had to take this fact into account, and to keep in mind, as the most important, the same points which are important in dyeing operations, as acidity, alkali content, percentage of neutral oil, etc. Since in most recent years the utmost value has been assigned the behavior of the sulphonated fatty acids in the form of soaps and wetting-out agents, these points are also to be characterized as important in estimating the value of a Turkey-red oil. We arrived, then, at the realization that sulphonation with sulphuric acid monohydrate, as it had been carried out, was no longer sufficient to produce such products. New methods of sulphonation had to be devised and tried out, all of which, however, produced only regular sulpho-carbonic acids, homologues of sulpho-acetic acid. It is no longer a question of enigmatic "organically combined sulphuric acid," but of precisely definable chemical compounds of fatty acids with sulphuric acid, which, to be sure, have not yet been prepared in a pure state and analyzed, because they are expressly colloid in nature, but which, according to their method of formation and their behavior, must be regarded as definite chemical compounds. It is plain that the analysis of such compounds should consist in a testing of how far they would satisfy the demands placed upon them; and this again requires a characterization and formulation of these demands which shall be as exact as possible. These standards are naturally established upon a high level, so that one may feel more certainty of the suitable nature of the products offered for a particular purpose. So, we now arrive at the question, how far the demand for stability of these oils should rightly extend.

The question may be answered from two different angles: From that of the consumer, the products should satisfy those demands which he makes upon them in practice; a raising of the standard is of no use to him, and indeed would hardly be desired by him. On the other hand, the manufacturer desires to make his products better and better, on account of trade competition, or at least that they may be considered as better in comparison with similar products; he offers standards which nobody requires, but which, through their psychological effect upon the buyer, help the manufacturer to dominate his field.

In other words, it is a question of advertising tricks, with which neither science nor real practice have anything in common. Unfortunately, the second method of evaluation seems to be acquiring a more and more firm foothold.

Before me there lie the proposed standards for

analysis of Turkey-red oil, worked out by the Standards Commission of the Association of German Turkey-red Oil Manufacturers E. V.

Even the point of origin of these proposals permits one to draw certain conclusions, not to be doubted, as to their character. It establishes standards for the competition which exists between the different manufacturers. On this ground alone the proposals belong more to the situation in trade than to the technical one. As a matter of fact—Praestabitoel, for example, shows a stability toward calcium compounds, which makes it possible for this product to be dissolved, clear, in water coming from a lime-pit! although such a degree of stability toward lime is not desired by anyone. Fundamentally, there would be nothing to object to in all this, if one knew the exact composition of Praestabitoel, and could deduce its behavior from its constitution. But this is not the case. The composition of the product is an absolute secret. The purpose which it should serve would not satisfy such a standard.

Yet the establishment of standards is to a certain extent a conception, an expressed unification between maker and user, beyond the present level of what is required, when it is not expressly stated in the sales-conversations, or is mentioned only in general terms. From this, it follows that correct standards cannot be established from one side only, not merely from the side of the manufacturer. The consumer has a word to say. And this may perhaps lend some weight, in my opinion, to the following viewpoint:

The stability of an oil is a consequence of its chemical composition, which can be more or less definitely characterized. If this is not the case, that is, if the stability of a given product does not find any theoretical explanation, we are tasting in the dark; no establishment of a standard can be of any use if it can easily be evaded beforehand.

We must, therefore, so establish the standard of stability toward lime and magnesium, that the salts of these, with the sulpho-fatty acids, shall be soluble in water; the magnesium salts easily, the calcium salts only very difficultly; yet only so far, that the lime content of the water being used shall cause no precipitation. This is all true of the pure sulpho-fatty acids. The sulphonated acids obtained from natural oils are obviously never pure. They contain a certain amount of unsulphonated fatty acids whose calcium and magnesium salts are insoluble in water. If these salts, however, cause no turbidity in the clear solution of the salts of the sulpho-fatty acids, this can be the case only because they are soluble in the latter, the magnesium salt being more, and the calcium salt less, soluble.

These two conditions of stability, however, are dependent upon the nature of the oils, as well as upon the method of sulphonation which has been used.

In order to obtain a stable oil, the sulphonation must be pushed as far as it can be made to go. In these days, it is a generally known fact that such a complete sulphonation cannot be attained with sulphuric acid monohydrate, but can be with sulphur trioxide in any form, including that of chlor-sulphonic acid. This reagent leads to the formation of true sulphonic acids, which possess the desired stability. So far as the methods covered by recent patents, which employ monohydrate and yet yield stable oils, are concerned (sulphonating at a low temperature through rapid addition of the monohydrate), these methods must also lead to the formation of true sulphonic acids.

That the sulphonation-products of different oils, prepared by the same method, behave in the same way, is perfectly true; it is certainly reasonable to suppose that some of them contain a mixture of the alkali salts, which will tolerate contact with a very strongly diluted calcium-salt solution, without precipitating a lime soap; and some of them may conceivably tolerate a less dilute solution of lime compounds.

As a normal sulphonated oil of a definite stability toward lime, we can therefore consider as such only a product which is prepared from a definite natural product by an exactly defined method of sulphonation.

The stability of such an oil toward lime can serve as a standard, with which the behavior of all other products can be compared. The same holds good for stability toward all other conditions, as acid, alkali, salt, etc.

If we look more closely into the chemical basis of different kinds of stability, toward this or that influence, the stability toward magnesium salts is the only one which can be ascribed to the oils without qualification, and which rests actually upon the solubility of the sulpho-aliphatic acid salt in water. On the contrary, the stability toward caustic or acid has its origin in the difficulty of salting out the neutral or the acid sodium salts of the sulpho-aliphatic acids. These sulpho-carbonic acids are dibasic, and the sulpho-group is first neutralized when the acids are treated with alkali. The acid sulpholeate is difficultly decomposed by dilute acids, even in the heat; it is owing to this that in salting out a solution of the sulpho-aliphatic acids these are not separated as such, but as the acid sodium salts, even when free mineral acid is present through deliberate addition, or through a previous reaction. The acid sulpholeate can be salted out, the neutral salt cannot; so the completely neutralized sulpho-carbonic acids remain in solution even in saturated salt solution, and correspondingly in concentrated lye, such as is used in mercerization. In weak mineral acid solution, the neutral salt first changes to the acid salt, and this latter always remains in solution up to a certain concentration of mineral acid, which may be sufficient to throw out the oil. As long as the acid is neutralized by the alkali

of the carboxyl group, the stability of the oil toward acids is naturally only an apparent one.

The solubility in a 1 per cent solution of sulphuric acid (10 g.H_2SO_4 per liter) is a standard which can easily be determined. This percentage is much too high for wool dyeing with acid dyestuffs, which require an addition of 0.2-0.3 per cent of acid at the most. For carbonization of wool, a solubility in up to 5 per cent sulphuric acid is necessary.

The proposals mentioned consider a stability toward strong caustic, which amounts to 37.7 per cent of NaOH; that is, a stability toward caustic which will be useful to those who deal in the oils, but only for the purpose of enticing buyers. No textile fiber is treated with such a concentrated lye.

The proposal for the standard of stability toward acid is still more characteristic. The amount of oil which is to be added to a liter of dilute acid is to be less than 3 g.; and when we consider that the oils occurring in commerce contain perhaps 34-36 per cent of fatty acids, then the amount of fatty acid involved falls to about 1 g., that is, 0.1 per cent of the acid bath. What action such an addition can exert can naturally not be estimated; but at the same time the oils are used to advantage as wetting-out agents, and we do not as yet possess any exact method for determining the wetting-out properties, numerically, of any liquid. The behavior of the neutral sulpho-carbonic acid salts toward acids has already been taken up; the alkali is first split off from the carboxyl group; the acid sulpho-salt remains still in solution, and can be decomposed into the free acid only with difficulty, as Herbig has recently shown.

If the stability toward acids of such oils is to be given an actual value, they would have to remain unchanged in hot and in cold baths for a period of time which is only to be established by practical experience in the technique of dyeing, carbonizing, etc., during which time the wetting-out action of the bath is required to be effective.

This period of time the proposed standard establishes as 24 hours with 5 per cent acid in the cold, and as one hour at the same percentage in the heat. Such figures are entirely arbitrary, and have been selected without previous consultation with practical workers. The stability toward acid is tested by estimation of the degree of turbidity which arises, through the so-called writing-test, which is of no importance in practical work, since we are concerned rather with the wetting-out power of the liquid, for which the test mentioned is of little value.

From merely the above selections, it may be perceived that all these standards display essentially an academic, or, better expressed, a commercial-academic, character, and are of no value to the consumer; they produce only confusion in the mind of a consumer not chemically trained.

A correct standardization of Turkey-red oils from the commercial viewpoint can be established only when the veil which covers the chemical aspect of all these products is removed. It must be made clear for all time just what "Praestabitoel," "Flerhenol," and similar "ols" and "pols" are, chemically; what properties these products must possess if they are pure; whether or not they form pure, or, as we say, technically pure chemical individuals. These compounds could then be allowed to serve as standards, with which all the commercial products brought upon the market under various protective names could be compared and definitely evaluated.

Colors Selected by National Retail Dry Goods Association for the Winter Season

The Color Coordination Committee of the National Retail Dry Goods Association, at a meeting held recently in the offices of the Textile Color Card Association, selected seven dress colors to be highlighted for the holiday and late winter season.

The new shades all appear on the advance Floss Card for spring 1931 recently issued by the Textile Color Card Association to its members. They are—Hilite Blue, Clematis Blue, Amulet Blue, Fraise, Woodland Green, Rose Cedar and Muscade Beige.

These dress colors, which are also expected to carry over for early spring, were adopted specifically with reference to their becomingness with the basic fall colors and black, which customers are now wearing in coats. Manufacturers are asked to provide these shades, which fall in the range of more animated medium tones, rather than a large number of miscellaneous colors, many of which would not be appropriate to wear with the prevailing basic coat colors.

It was explained by A. G. Jarvis, Chairman of the Color Coordination Committee, that the endorsement of certain shades for daytime wear in dresses is consistent with the Committee's principle that such spot-lighting of the colors in advance of a season not only clarifies the color situation for manufacturers, but assures the retailer of finding in the market colors best suited for customer ensembling.

A resolution was unanimously passed by the Committee requesting manufacturers to use the official names of the Textile Color Card Association when showing these colors in their lines. In this way retail buyers may make out their orders using these names, with the assurance that manufacturers will easily identify the colors ordered.

The new special apparatus manufactured by the Aktivin Corporation for the determination of total fatty acids in soap was on display in the Clemson College textile department booth at the Southern Textile Exposition.

This apparatus was especially designed for the rapid estimation of total fatty acids in soaps, soap powders, sulfonated oils, etc. The Clemson booth exhibited it for the first time in America.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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SIXTY-FIRST MEETING OF THE RESEARCH COMMITTEE, SEPTEMBER 26, 1930

The Sixty-First Meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., September 26th, 1930, at 3.30 P.M.

The following were present: L. A. Olney, Chairman; W. D. Appel, Wm. H. Cady, Hugh Christison, Ralph F. Culver, Harry R. Davies, Carl O. Draves, Walter C. Durfee, Henry D. Grimes, Walter E. Hadley, Dr. J. F. X. Harold, B. L. Hathorne, E. H. Killheffer, Harold W. Leitch, George A. Moran, Wm. R. Moorhouse, Walter M. Scott, W. S. Williams, P. J. Wood, and as guests, Dr. Warren E. Emley, Bureau of Standards, John J. Sokolinski.

Letters of regret for non-attendance were received from E. F. L. Lottee, H. D. Clayton, Hans Meyer, and H. F. Herrmann.

At the suggestion of Dr. Killheffer, the Chairman took up the methods for testing fabrics for various properties, on which the sub-committees have been working, with the idea of determining just which methods were ready to offer the Association members at the next Annual Meeting to be adopted as official.

The Sub-Committee on Fastness Tests for Dyed Silk recommended for approval as official their tests for fastness to washing for silk. In this connection samples of the four dyed silk standards for this test were exhibited. It was voted to have these cut in 4 in. x 8 in. swatches and the price was set at $1.00 for a set of four swatches, one of each color. It was voted, however, that before these are placed on sale that they be tested at the Bureau of Standards to make sure they come up to specifications and for the purpose having a permanent record made of these at the Bureau Spectrophotometrically and otherwise so they can be duplicated in the future.

The Sub-Committee on Fastness Tests for Dyed Cotton recommended its methods and standards for fastness to washing for dyed cotton for adoption as official. Mr. Moran, Chairman of this Sub-Committee, was instructed to look into the matter of procuring about 100 yards of cotton woven and dyed with each of their standard colors to be later placed on sale.

The Sub-Committee on Fastness Tests for Dyed Wool recommended its methods and standard for fastness to washing and Mr. Christison, Chairman of the Sub-Committee, was instructed to procure worsted

fabric dyed with their various standard colors to be later placed on sale.

The Sub-Committee on Fastness to Perspiration felt their method was ready for adoption as official. They are, however, now doing work on checking the pH of their solutions against those actually found on perspiration by our English colleagues. They will further report at the next meeting. In connection with the work of this committee it was decided that this Committee study the matter of a fastness to urine test and the possible relation of such a test with fastness to perspiration test.

B. L. Hathorne, Chairman of Sub-Committee on Rayon, reported progress.

Wm. H. Cady, Chairman of Sub-Committee on Light Fastness, reported on correspondence with German and English Committees. A set of German standards have been received and are being tested in Fade-Ometer and next Spring and Summer will be tested to sunlight for comparison with previous tests of Committee.

Dr. Jos. F. X. Harold, Chairman of Sub-Committee on Methods of Testing Waterproof reported on further work by his Committee and promised further report for the Year Book.

The Chairman reported on the work of the Sub-Committee on Sizing, etc., and stated this Committee was now working on qualitative and quantitative tests for sizes and finishes.

The Chairman also mentioned the report of the Sub-Committee on Bibliography and Research Survey which is to appear in the 1930 Year Book.

The Sub-Committee on Color Standardization reported considerable progress, a very voluminous bibliography of work on this subject having been compiled. This will be published in the new Year Book.

The Chairman discussed the advisability of forming a new Sub-Committee on Materials for the Construction of Dyeing and Finishing Apparatus. Inquiries are frequently made as to the suitability of this or that metal for the construction of dyeing apparatus, that is to be used for specific purposes and it was thought that a systematic investigation of this subject might prove of interest and value to the members of the Association. Such a committee was authorized and Harold W. Leitch was appointed chairman with the request that he select other members for his committee and report at the next meeting.

The meeting adjourned at 5:30 to meet next in New York, October 24, 1930.

Respectfully submitted,

ALEX. MORRISON,
Secretary.

SIXTY-SIXTH COUNCIL MEETING
SEPTEMBER 26, 1930

The Sixty-Sixth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., Friday afternoon, September 26th, 1930.

The meeting was called to order at 2:00 o'clock with the following present:

President, E. H. Killheffer; Vice-Presidents, P. J. Wood, Walter S. Williams; Treasurer, Harry R. Davies; Councillors, Walter M. Scott, Wm. R. Moorhouse, George A. Moran, Hugh Christison, Ralph F. Culver; Councillors ex-officio, Prof. L. A. Olney, Chairman, Research Committee; Henry D. Grimes, Chairman, Northern New England Section; Wm. H. Cady, representing Richard B. Earle, Chairman, Rhode Island Section; Secretary, Alex. Morrison.

Regrets on the inability to attend was received from A. M. Burt, Chairman of the Philadelphia Section.

The Secretary's report of the Sixty-Fifth Council Meeting, held June 27th, 1930, was read and approved.

The Secretary's balance sheet was read as follows and approved:

Financial Report of Secretary
September 25th, 1930

Cash on hand 6-26-30	$449.75
Receipts 6-26-30 to 9-25-30 incl.	
Applications (23 @ $5.00)	115.00
1930 Dues (5 @ $5.00)	25.00
1931 Dues (2 @ $5.00)	10.00
Atlas Electric Devices Royalties	22.00
Year Book Sales (8 @ $3.00)	24.00
Pins (2 @ $1.50)	3.00
Howes Publishing Co. REPORTERS	1.25
	$650.00
Disbursements:	
7-21-30—Research Fund—to Treasurer	$45.00
7-21-30—General Fund—to Treasurer	400.00
Exchange charges 8-2-30	.25
Cash on hand—Andover National Bank	185.25
Cash on hand	19.50
	$650.00

The Treasurer's report was read as follows and approved:

General Fund—Sept. 11, 1930

Cash on hand Nov. 14, 1929	$6,106.60
Received to date	6,632.76
	12,739.36
Expenses to Sept. 11, 1930	3,684.76

	$9,054.60
Research Fund—Sept. 11, 1930	
Cash on hand Nov. 14, 1929	$2,487.16
Received to date	2,446.82
	4,933.98
Expenses to Sept. 11, 1930	3,540.48
	$1,393.50
Cash on hand in both accounts at Sept. 11, 1930	$10,448.10

The following were elected to membership:

Active Membership

Boedecker, Ray W.—2716 Lunt Ave., Chicago, Ill. Chemist, Colgate Palmolive Peet Co., Palmolive Bldg., Chicago, Ill.

Franklin, Jerome A.—Box 39, Augusta, Ga. Salesman, DuPont Co., Charlotte, N. C.

Grant, Robert J.—24 Everett St., Lynbrook, L. I., N. Y. Manager, Noil Chemical & Color Works, 152 West 108th St., New York, N. Y.

Gray, David—547 East Ave., N. E., Atlanta, Ga. Salesman, United Chemical Products Corp., Jersey City, N. J.

Levine, Harry—105 Clark Place, New York, N. Y. Laboratory Director, Silk Grading & Testing Laboratory, 381 Fourth Ave., New York, N. Y.

Max, Fritz—730 High St., Newark, N. J. Chemist, General Aniline Works, Grasselli, N. J.

Mosheim, J. D.—Chickamauga, Ga. Dyer, Crystal Springs Bleachery, Chickamauga, Ga.

Walton, Thomas L.—1616 Carolina Ave., Hartsville, S. C. Overseer of Bleaching, Hartsville Print & Dye Works, Hartsville, S. C.

Associate Membership

Blowney, B. C.—2486 Observatory Ave., Cincinnati, Ohio. Manager, Geigy Co., Inc., 232 E. Pearl St., Cincinnati, Ohio.

Ivey, J. W.—Technical Representative, Mathieson Alkali Works, Inc., Charlotte, N. C.

McCarty, George S.—128 Ridgewood, Ave., Charlotte, N. C. Salesman, Venango & F Sts., Philadelphia, Pa.

Murphy, J. E.—93 Depot St., Fitchburg, Mass. Chemical Engr., 7016 Euclid Ave., Cleveland, Ohio.

Peterson, C. J.—1009 Islesworth Ave., Charlotte, N. C. Chemist, Stein, Hall & Co., Inc., 908 Johnston Bldg., Charlotte, N. C.

Peyton, James J.—Apt. No. 109, Frederick Apts., 509 No. Church St., Charlotte, N. C. Chemical Salesman, General Chemical Co., 201 West First St., Charlotte, N. C.

Schanbacher, Karl L.—92 Mt. Hebron Road, Upper Montclair, N. J. Chemical Engr., Victor Chemical Works, 220 E. 42nd St., New York, N. Y.

Tilson, Fred O.—Poplar Apts., Charlotte, N. C. Salesman, Mathieson Alkali Works, 1006 Com. Nat'l. Bank Bldg., Charlotte, N. C.

The following were elected as of date thirty days after publication of names if no objection in registered by any member.

Active Membership

Dreisner, Wallace—Ocean Grove, Mass. Asst. Dyer, J. & P. Coats, R. I. Inc., Pawtucket, R. I.

Hall, Thomas J.—Dyer, North Carolina Finishing Co., Salisbury, N. C.

Keen, W. Rollin—727 Harper Ave., Drexel Hill, Pa. Chemist, Collins & Aikman Corp., Philadelphia, Pa.

Robertson, Julian—Bleaching, Dyeing & Finishing Plant Executive, North Carolina Finishing Co., Salisbury, N. C.

Schenck, J. R.—Supt., North Carolina Finishing Co., Salisbury, N. C.

Junior Membership

Fell, Ernest M.—559 President Ave., Fall River, Mass. Chemist, American Printing Co., Fall River, Mass.

The following are reinstated, having paid the delinquent dues: Edwin L. Donahue, R. H. Webb, A. S. Cooley, A. Henry Gaede.

A number of Junior members had signified that they were qualified to be listed as Active Members in the 1930 Year Book, now being compiled for publication. It was voted that these transfers be made subject to the approval of their qualifications by the membership committee.

"There was brought to the Council's attention the question of the arrangement with the Howes Publishing Company whereby the Association uses the AMERICAN DYESTUFF REPORTER as its official organ and it was voted that a suitable agreement be drawn which will continue into the future the same arrangement with the Howes Publishing Company as has prevailed in the past, provision in the agreement being made for termination at any time for any or no cause on two years' notice."

The following proposed amendment to the Constitution was presented:

"Our Founder and First President, Dr. Louis Atwell Olney, shall be designated as President Emeritus and a life member of the Council."

This was referred back to the Secretary to be presented for adoption as a resolution at the next Annual Meeting.

The detail duties of the Secretary's Office was discussed and it was voted to allow the Secretary not over $1,000 a year to employ part-time help to carry on the details.

A letter the President had written, addressed to the Textile Foundation Commission, requesting $5,000 per year for three years for the purpose of carrying on research work and a reply that the request will receive the earnest consideration of the Commission were read.

A donation of $500 from the National Association of Wool Manufacturers for promotion of research work was gratefully accepted and the Secretary was instructed to acknowledge it.

It was voted to transfer $2,000 from the General Fund to the Research Fund.

It was voted to allow Prof. Olney, as Chairman of the Research Committee, $500 to use at his discretion in employing additional research assistant or assistants at the Lowell Textile Institute.

Dr. Walter M. Scott was appointed a committee of one to investigate the matter of a Color Exhibition under the auspices of the Museum of the Peaceful Arts in New York.

Dr. Jos. F. X. Harold, Chairman, Technical Program Committee for the Annual Meeting, reported progress.

The meeting adjourned at 3:30 P.M. to meet next in New York City, October 24th, 1930, and the tentative date for a further meeting was set as November 21, 1930, in Boston.

Respectfully submitted,

ALEX. MORRISON,
Secretary.

APPLICANTS FOR MEMBERSHIP

Active Membership

Booth, Arthur, instructor of textile chemistry and processes, Paterson Vocational School, Ellison and Summer Streets, Paterson, N. J. Sponsors: P. J. Wood and C. F. Hoppe.

Kneeland, Dexter R., superintendent of dyeing, bleaching and finishing, Bates Manufacturing Company, Lewiston, Me. Sponsors: W. H. Zillessen and William A. Keating.

Patton, W. R., dyer, Durham Hosiery Mills, Durham, N. C. Sponsors: A. R. Thompson, Jr., and Alex. Morrison.

Junior Membership

Gallagher, Arthur F., chemist, Hillsborough Mills, Wilton, N. H. Sponsors: Charles L. Howarth and Alex. Morrison.

Howard, Lorne F., student, Lowell Textile Institute, Lowell, Mass. Sponsors: Louis A. Olney and John H. Skinkle.

Ivers, Gerald A., student, Lowell Textile Institute, Lowell, Mass. Sponsors: Louis A. Olney and John H. Skinkle.

McAllister, Gordon A., student, Lowell Textile Institute, Lowell, Mass. Sponsors: Louis A. Olney and John H. Skinkle.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

BLISS MORRIS JONES
Managing Editor

MYRON DREW REESER
Advertising Manager

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LABELING AND DYESTUFFS

THE dyestuff manufacturers, converters, and mills doing their own dyeing, have long neglected an important marketing device that has been used successfully in many other industries—that is the labeling of goods. There are two main methods of labeling: the first consists of a tag of some sort which identifies the product with a certain company; the other method of labeling is to mark the goods with the object of giving the over-the-counter buyer more accurate information.

The first method has developed by leaps and bounds in this country. We have only to think of automobiles, sheets, ready-made clothes, etc., to see how far trade names have gone. The second method, however, has not been used widely. There are very few products that are marked for the purpose of giving the consumer information.

In connection with the marking for consumer information, it is interesting to note what the Germans have done along that line with dyestuffs in England, the Dyestuffs Industry Development Committee to the Board of Trade made several interesting references to the "Indanthrene Campaign" of the German manufacturers in the English market.

The report reads: "the I. G. Farbenindustrie evidently realizing that competitive textile countries have protected their dyemaking industry is now pushing with extraordinary zeal the sale of Indanthrene fast dyes. By arrangement with the I. G., manufacturers who use a certain selected list of dyestuffs are authorized to attach 'Indanthrene' labels to their products, and by regular advertising the public is now beginning to demand goods bearing the Indanthrene labels, which, of course, can only be dyed with I. G. dyestuffs."

The report goes on to tell about the effect of this campaign on the British dyers, and stresses the danger to the British dye industry if nothing is done to combat the German drive.

The success of the German campaign, as shown by the quotation from the Dyestuffs Development Committee, shows very clearly that the time has come when it is no longer good policy to neglect such a potent sales method.

Not only would such a method of marking help the dyestuff manufacturer, but it would also help the better quality converter. For years the reputation of American dyers has been questioned. There has been no end of agitation for fast colors and methods of marking fast colors. If makers advertised to the consumer the names of fast colors, and the converter could label the names of the color on the goods, the ultimate consumer would then have no difficulty in obtaining goods which were suited to any particular use. It would put an end, once and for all, to the practice of using fugitive colors where fast colors are required.

SAFEGUARDING MACHINERY

ACTIVITIES designed to stimulate the interest of foremen and employees in accident prevention, and to educate them in sound practices, are usually considered fundamental in any industrial safety program. But these alone are not enough. Education and incentives to safe practice cannot of themselves remove the hazards presented by a lack of safe working conditions.

Methods which are used by employers to provide safe working conditions in their plants are described in a report entitled "Making the Plant Safe." This publication, which has just been issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Company, is the ninth in a series of reports based upon a study of the field of safety engineering and designed to present the principles governing successful accident prevention work.

Accident statistics show that the largest number of injuries result from unsafe working methods rather than from unsafe conditions. However, there are many operations which can be made safer not only by guarding machinery and training employees in safety, but also by revision of operating processes. For example, many times mechanical labor can be substituted for a particularly hazardous manual operation.

Besides the direct preventative effect of safeguarding and engineering revision, these activities have an important indirect influence on the occurrence of accidents and the maintenance of a good safety record. It has been found that a reasonable amount of attention to the physical safety of the plant and to good housekeeping methods on the part of the management, does a great deal towards getting the full support of the employees.

When safeguarding machinery was first attempted, the actual methods were left to local management. Since then, however, standard codes and regulations have been prepared to cover many phases of the subject. Whether an employer is compelled to comply with these standards

or not, it is usually good policy to follow them closely. The employer can never tell when the law may change and he will have to use the standard methods of safeguarding.

The most efficient and safest guards are those which do not interfere with the use of the equipment. If the machine guards are in the way of the operator or if they curtail production or are difficult to remove and replace, they are frequently cast aside. Such guards are the most dangerous, for once they are removed, the hazard increases greatly. Employees quickly and unconsciously form the habit of relying on the guards, and when they are taken away the habit still persists.

EXTRACTORIALS

In Ansonia, Conn., eight small boys astounded their parents when, after swimming in the Naugatuck River, they returned home with green hair, green eyebrows, green eyelashes.—*News Item.*

Mrs. Wilmer Coggins

8 Myrtle Ave., Ansonia, Conn.

Dear Mrs. Coggins:

With reference to your recent letter, I regret exceedingly that your son, Ralph, came home with green hair after swimming in the Naugatuck River below our mills, but inasmuch as the river is posted, I fail to see that any responsibility for his color rests with our firm.

We have a perfect legal right to manufacture green blankets at our plant and we also have a permit to dump the surplus dyestuffs into the Naugatuck.

We've been called to task for this condition before, Mrs. Coggins, but the court has always decided in our favor. Only last spring a gentleman from Ansonia came to us with a purple mustache because he'd fallen out of a boat one day when we happened to be making a large order of babies' blankets. We did all we could to placate this man and even agreed to have him dry cleaned at our expense, but he insisted on a legal trial, which he lost.

If you will send Ralph over to the plant at your convenience, we will be glad to soak him in our vat No. 8 in the hope that we can restore the natural color of his hair, although, I must say, Mrs. Coggins, that we use vat dyes in our merchandise and guarantee them against running or fading.

The only alternative that I can suggest is that we dip Ralph in a boiler of black aniline which will be a less conspicuous shade than he's dyed now. I will call you on the phone the next time we have a run of laprobes.

As a matter of fact, Madam, you ought to be thankful that your boy didn't have a full beard when he dove into the Naugatuck, or matters could have been worse if we had been emptying the overflow from a run of striped woolen mufflers.

I'll grant you that green hair is not a very popular shade but, at least, his hair and eyebrows don't clash, as we say in the woolen industry.

Yours truly,

Jack Cluett, Chief Chemist,

Ansonia Woolen Mills, Inc., Ansonia, Conn.—*Life.*

It is the most efficient organization that asks for the most help and it is usually the inefficient organization that resents any help.—*Starchroom Laundry Journal.*

What a world! If you say something everybody believes, it's a platitude. If you say something new, it's heresy.—*Publishers Syndicate.*

There appears to be a tendency in human nature occasionally to exaggerate conditions and possibilities for prosperity when prices are rising. And a radical pessimism seems to creep in when trade is depressed.

The inference is that when capital is plentiful, many business men extend their operations, and when capital is scarce, they cut them down—in other words, they retrench.

Thus it might be said that business cycles are partly effected by the action of business leaders who sometimes go to extremes of optimism and pessimism. It is suggested that increased scientific procedure would help to avoid such happenings in many instances.—*Business Bulletin.*

It is reported here that the Soviet Government has decided, following the advice of the Higher National Economic Council, on the creation of a Museum Institute of the History of Chemistry. The object of this establishment will be to study the development of chemical science and industry, to popularize the knowledge of chemistry, to contribute to the chemical progress of the country and thus ultimately to benefit the chemical industry. To this end a credit of fifteen million rubles has been opened. —(*Assistant Trade Commissioner Earle C. Taylor, Paris.*) *World Trade Notes.*

It is the duty of every man to protect himself and those associated with him from accidents which may result in injury or death.—*Abraham Lincoln.*

If the southern mills will continue their present curtailment for another year, or absolutely limit themselves to a single shift of fifty-five hours, they will restore themselves to prosperity. As I am a southern manufacturer myself I thought it proper to express my own opinion thus frankly.—*Pres. Ward Thoron to Nat'l Assn. Cotton Mfrs.*

According to Bradstreet, the business man who does not advertise runs a greater risk of failing than one who does. The figures show that 84 of each hundred merchants who fail in business did not advertise. The percentage of failures among spasmodic advertisers must be nearly as high.

Advertising is a vital necessity to the growth and expansion of any business—but it must be persistent.—*Dyer & Calico Printer.*

The Efficiency of the Hydroextractor

By **FRED. GROVE-PALMER, A.I.C.**

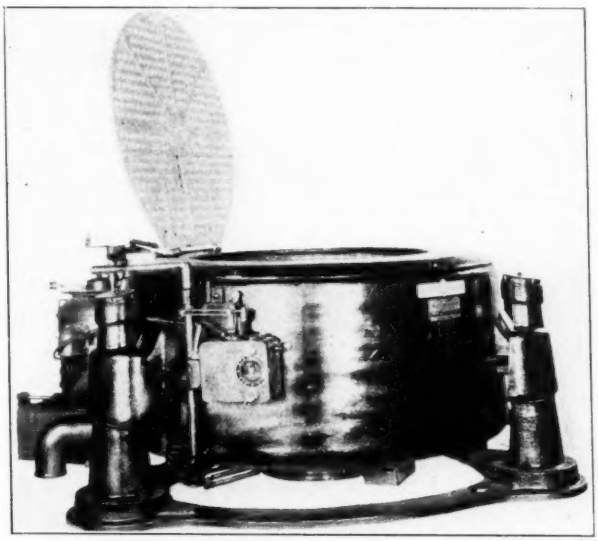
IN THE endeavor to get a comprehensive idea of the efficiency of hydroextractors from the dyehouse slant, one is sometimes surprised at the difficulty there is in getting hold of reliable statistics.

The purchase of additional machines is always complicated by the embarrassment of riches presented by the descriptive literature of the various manufacturers all of whom, quite naturally, argue that their own is the best. The easiest way out of the impassé is to get quotations from all possible sources and buy the cheapest, but that is not a method that can be recommended as a general practice.

When the makers are invited to supply certain definite facts and figures they always reply readily enough and pass along everything they have which has any bearing upon the matter; such information is valuable and to a certain extent reliable, but it should never be forgotten that the findings in one mill are by no means automatically true in the next. To believe otherwise might easily lead to disappointment. Even at trade conferences when many data are brought forward for discussion it is frequently seen that the results regarded as normal by one dyehouse would be scoffed at in another.

Hydroextraction is regulated in a variety of ways: some whizz for a certain number of minutes, others let it go on until no more water is seen coming from the drain-off pipe. Many dyers would not be in a position to state whether the moisture content of all batches leaving the basket is the same or to what extent it varies or why. They could tell the number of pieces of broad silks or hanks of yarn that have passed the hydros, very probably, but they might find it more difficult to give the actual or average weights of the batches so treated.

By working batches consisting of a certain number of pieces a practical working time can be arrived at and the dyer is enabled to estimate within a little, always barring expected and unexpected delays, how much he can get out in the course of the shift. If the number of pieces is divided into four lots, these can be put into the cage of the hydro evenly, thus avoiding bad loading. Electrically driven machines will indicate when the top speed is reached, other drives must rely upon the experience of the operator, but if the full speed is maintained for the time found to give fair results, any excess of water that may be left in the goods will be removed when they pass into the drying room. It is doubtful if there would be any gain in the long run by trying to work to any greater exactitude. It is not as though a dyehouse is always working on just one class of fabric; it is very much the opposite; fabrics and fibers of all sorts are probably being dealt with at the same time, and it would add far too much complication to life if every weave, fiber or mixture had to receive special treatment in the extractor.



If everything worked with clocklike regularity it might be possible, but it is not that way in real life. A batch is hung up in matching the shade, it comes out of the kettle and goes straight to the hydro and another follows right at its heels. If no other basket is empty, the second may have to stand for fifteen or twenty minutes, meanwhile the water is draining out of it. Batches lifted at the change of shift or when the hooter blows for dinner time also get a longer draining period. Some fibers and weaves will hold the water more tenaciously than others and there is always the performance of the machine to be taken into account. If it is belt driven, the belt may need tightening today; when that is done the speed may be perceptibly greater. In plain fact, absolute regularity of work is practically impossible and, in consequence, the dyer has to get on with it as best he may, always aiming at the maximum results and striving to keep the machines up to that standard.

The amount of cloth that can be put into the hydro cage is regulated more by the bulk than by the weight.

Makers of the machines will give the maximum weight that their baskets will hold, allowing a big margin of safety. Some such figures are given here:

Diameter of cage in inches.....	40.	48.	60
Capacity of cage in cub. ft.....	6.4	10	16.4
Maximum load allowed in lb...600		900	1200
Approx. dry wt. of such load...200		300	400

Obviously textile loads of that size are out of the question, because there simply would not be room for them. One hydro-making firm has computed from various sources average loads for a number of different fibers and cloths; the quoting of a few items from the list for the sake of comparison is not without interest. The following figures show the dry weights in pounds:

Diameter of cage, inches.....	40.	48.	60
Cotton yarn, lbs.....	110	160	250
Woolen yarn, lbs.....	100	150	240
Flax fiber yarn, lbs.....	150	230	370
Silk and Rayon, lbs.....	110	160	250
Jute yarn, lbs.....	140	200	320
Cotton goods, heavy	130	180	300
Woolen goods, heavy	90	140	220
Silks and Rayons, various	90	140	220

From these data it is seen to be a fact that hydros in the dyehouse habitually run under very light loads as compared with their ratings; in the majority of cases they carry around fifty per cent of the weight for which they are constructed. It might be thought that in view of this the makers could send out much lighter machines, but the matter is not so simple; there must be the weight of metal to withstand the centrifugal force exerted on baskets of commercially useful sizes when running at full speed apart from the weight of the load that may be put into them.

Whether the load is a light one or heavy, it is essential for the smooth running of the centrifuge that it should be evenly distributed in order to avoid swaying. Modern machines, it has been pointed out, are built to cover a multitude of sins of bad loading, but they should not be badly treated for all that. One of the best practical methods of preventing this is to break the batch of goods into four equal parts, and if these are each enclosed in a cotton swabnet, the four separate bundles can be dropped into the basket at regular intervals. This saves much time in stowage, prevents the slipping of the load in the earlier stages of the run and greatly facilitates unloading. Dyehouses that have not already introduced this simplified method of handling should not have any difficulty in devising a means whereby the goods in running up out of the baths can be collected right away in the nets.

With hanks of yarn that are dyed on sticks, it is an easy matter to divide the number of sticks by four and put the contents of each section into the net. If it is preferred to whizz the skeins without a covering cloth, they should be packed around the outer wall of the cage first, gradually filling in towards the center. Care should be taken to see that no ends are sticking up into the air when the loading is complete, otherwise there may be shifting which will cause damage and tangling.

The length of time that the hydro should be working at maximum speed in order to produce the best drying effect depends upon a number of circumstances all of which play a more or less important part. It is a matter for regret that exactly to what extent each of these factors affects the result cannot be definitely stated, but that they do have a cumulative effect there can be no doubt. Some of the points are discussed here:

(a) The quantity of liquid in the batch at the time of loading. This is not so important in practice as would appear at a first glance, because at the beginning of the revolutions, before the cage is whizzing at full speed, the greater part of the water is thrown out, and the result of the top rate running is to get rid of a part of the residue that is left in.

(b) The size of the cage. Smaller baskets revolve more rapidly and if they are, therefore, more effective, they do not hold so much; consequently there is not the same output. In this connection it may be noticed that the capacity of the baskets of some makers differs from that of others for the same diameter; this appears to be largely due to varying methods of calculation and allowance for central dome or spindle casing. Sometimes the figures state the full geometrical capacity of the cage; at others the net available space is given.

(c) The number of revolutions per minute. This is, of course, a matter of great importance but it must not be taken as a fact that the greater the speed the better. Taken as a general rule the working speed of dyehouse centrifugals here is considerably lower than is the common practice in English dyehouses and in this connection it is interesting to see the makers' figures for similar types of machines in catalogues of the two countries:

Basket diameter, inches.....	40.	48.	60
American make, rpm.....	850	700	500
English make 'A', rpm., 42"...	950	900	750
English make 'B', rpm., 42"...	900	850	700

This difference in speed does not make for lighter machines; the weight of a four foot machine of the first type named above is around four hundred and seventy-five pounds greater than that of the second. The drying efficiency of high speeds and very high speeds does not vary much; there appears to be no point in working very fast. In the same way there is not a vast difference between high and moderate

speed. Of course, it might be argued that if that is the case, why let the baskets move at all? But it cannot be taken to a logical conclusion in that way. Undoubtedly, the lower rate does not remove so much water in so short a time, but the saving of power, the quickening of unloading because the goods do not get so tightly packed down, the increased loftiness and fluffiness of the fibers arising from the lighter packing are all factors in favor of the more moderate speeds and to prove this, if proof be needed, we have recently had information from a reliable source that English users, especially in the rayon section of the industry, are returning their hydroextractors to the makers to have the speeds reduced more in conformation with those in use here.

(d) The fiber and the weave play an important part in the time required for efficient centrifuging. Loose, light nets will not retain the liquid to the same extent as a close, coarse yarn cloth, and some fibers are much more absorbent than others.

(e) The temperature of the liquid and of the dyehouse. There is some difference of opinion about the influence of temperature: many old-fashioned dyers of great experience are sure that the machines do their work better in the summer than in the winter. It may be only an idea but he would be a brave man who would disregard the expressed views of extended observation. Concerning the quicker ejection of hot liquors there is probably less discussion; in some dyehouses a hot wash is given purposely with a view to hastening the extraction. With due respect to those who do not agree, a cold load is slower than a hot one, it may be suggested the cohesion of hot liquids is lower and, moreover, the cells of the hot fibers are more open and therefore able to part more readily with the liquids contained in them. Practical experience with hot and cold liquids indicates that there is a saving of between ten and twenty per cent in the time required for extraction in the former condition.

As to the number of loads per hour that can be expected from a hydro it must be borne in mind that it is not the actual working that counts; the greater part of the time is occupied in loading, unloading, getting up speed and braking down. Because of these factors it is really doubtful if more than three or three and a half loads can be handled per hour as an average over a battery of extractors of several makes and all stages of efficiency. One maker of machines has kindly supplied the following estimated numbers of loads:

40 and 48 inch cages.....5 loads per hour
54 and 60 inch cages.....4 loads per hour

It may be possible to get out as many as this but only, one ventures to think, in exceptional cases where the loads are very easily handled and everything is running very smoothly. As a help in economy of time it is always advisable to install extractors in pairs under the supervision of one operator who is thus enabled to be attending to one of them while the other is working.

The principal test of the efficiency of the hydroextractor lies in the amount of water that is left in the load, not in the quantity that is whizzed out; that is of little importance. The moisture remaining after the cage has been unloaded has to be dried out on the tenter or on the cans;

if it is considerable, the work of drying will be prolonged because of the slower passage of the goods and there may be physical differences in the fabrics which are dried with varying water contents. Very little information is available upon which to base definite views of what may be looked for. The formula for making the calculation that is given here has been sent in with a view to helping to arrive at definite conclusions and it would be interesting to the industry as a whole if figures from many sources could be collected and collated.

$$\frac{(HW - DW) \times 100}{HW} = \text{percentage of residual moisture}$$

HW is the whizzed weight of the goods,
DW is the dry weight.

In some qualities of silk and rayon goods the residual water may be as low as sixty or even fifty per cent of the dry weight, but far more often it is as much as one hundred per cent.

The material and make-up of the cage of the extractor are points which have been discussed on a number of occasions but it may not be inadvisable to make further allusions to some of the points here. Many old established mills cling to the wire cage believing it still to be the most efficient type of basket that has been produced, and there seems to be really little doubt that such an opinion is fully justified. If the cage is looked upon in its right light, it is a means of retaining the fabrics and letting the water through, consequently, a woven wire basket is the ideal form. Made of steel or copper wire well coated with tin and supported by tinned steel straps at frequent intervals, securely welded to the top and bottom plates, it presents no resistance to the centrifugal force which is expelling the liquid. The complaint that such cages soon lose their shape is hardly justified if reasonable care is taken in handling, and though there may arise a danger of tearing the goods if broken wires are allowed to pass unnoticed, such breakages can easily be mended before they get too bad, and, moreover, there is not the same risk of a flaw in the metal causing the cage to fly into pieces when revolving at top speed. This is not, perhaps, a very frequent occurrence in modern times, but it has happened and is an awe-inspiring sight. Wire baskets can be quickly cleaned with a stiff long bristled brush assisted by a hosepipe.

The newer forms of hydros are often fitted with perforated plate cages of mild steel or copper, properly tinned. If the perforations are made by boring and not by punching, this form of basket is good and finds favor everywhere. Punching the holes often causes a weakening of the plate through cracking around the orifice; this leads to the collection of dirt and eventual corrosion. In the tin-weighting department and others in which strongly acid solutions are used, the metal plate is coated with hard vulcanized rubber which is one of the few practicable materials that will stand up to the work. If the question of expense has not to be considered it will be found that Monel metal will give good service and there are other high grade incorrodible metals available which will give satisfaction. Aluminium baskets have been employed for special cases. Mild steel plate is much cheaper than copper and is at least fifty per cent stronger for plates of the same gage. In dyehouses where there is never any acid liquor used, a good and cheap form of hydro cage is one made of galvanized steel; this form could not be used in the silk dyeing, but would be very useful in other departments. The effect of dilute acids is to dissolve away the zinc coating and leave the iron bare; this would cause bad staining of the fabric, as it is more apt to rust than steel which has not been galvanized.

A formula which has been given for arriving at the centrifugal force exerted by a given hydroextractor is interesting because it is based upon the proportion to the square of the revolutions per minute instead of to the peripheral speed.

$$\frac{\text{Diameter of cage in ft. x rpm}^2}{6{,}000} = \text{Number of}$$

times centrifugal exceeds force of gravity.

It is useful sometimes to make a comparison between the results claimed by different makes of machines, but even then it is the matter of actual performance that chiefly interests the dyer. For that reason even though the type of extractor he has already installed may be quite satisfactory, he will lose nothing by making a careful survey of any of the others that the textile machinery market has to offer him, and above all he should always be ready to avail himself of the valuable information offered by the various manufacturers.

Color Standardization Will Not Impair Branding in Color

By Waldon Fawcett

THE latest fancied threat to expanding consumption of dyestuffs stands revealed as exaggerated if, indeed, it has any serious basis in fact. According to a few impulsive alarmists the spread of trade marking, via color, is imperiled by the current movement for the coordination or correlation of colors. The prediction, if warranted, was manifestly disquieting because American industry in all lines is but just well entered upon a trend to branding through the use of color that, carried to its logical conclusion, promises a steady and permanent increase in the use of coloring materials.

Double apprehension has assailed the color users who have worried over the effect of the new programs of color concentration sponsored in various industries and encouraged by the appropriate agencies in the U. S. Department of Commerce. First, the pessimists have feared that when the organized forces of color fashion selected, for seasonal glorification, a color approximating the color already in use as a trade mark exponent, said trade mark would, at least for the time being, be robbed of its individuality. Lost to public notice, that is to say, in the general surge of the temporarily popular color.

Secondly, misgivings have been aroused lest the new program of orderly color rotation—successively giving place in the sun to all conceivable tints and hues—nullify every claim to arbitrary distinction in color. The point is, in logic, well taken, that a color which was the fad of the hour among textile and apparel stylists could not consistently be claimed as the exclusive property of a single house that chanced to have first exploited it for trade mark purposes. If a unique or unappropriated color were the sole basis of property rights in a colorful trade mark there is plainly a menace in a system of color specialization which is likely to, sooner or later, grant every version of color its interval of triumph.

In all these premises, one point has been overlooked—the basis of whatever assurance be allowable that color

standardization has no power over trade marking in color. The vital qualification is that the Federal Government countenances no colored clue to the origin or ownership of merchandise which is not given distinguishing expression. Or, to put it differently, there is, within the recognition of the Department of Commerce (keeper of the official Trade Mark Register), no private property right in *mere color* as a trade mark. Color expressed in a device or a design is seldom challenged if it has not been anticipated. But, formless color, for color's own sake. Oh, no.

With Federal certification thus dependent upon the translation given to color rather than to bare color as a vehicle of trade marking, it necessarily follows that the intrusion of color standardization, permanent or temporary, is practically "outside the picture," however embarrassing it may be sentimentally. That a given hue is the color of the hour in popular favor and is the main dependence in the textile patterns of the period does not in the least impair the trade mark status of that self-same color provided the trade mark symbology is accomplished by form as well as by color. The cardinal principle of trade mark censorship calls for consideration of the appearance of a trade mark as a whole. Color is entitled to full weight for its contribution to the distinguishing ensemble, but it cannot be detached in appraisal and be allowed full responsibility for the trade mark function.

Antecedent to the misgivings regarding the effect of color standardization, and responsible therefor, in part at least, is the impression that administrators of the U. S. Patent Office have receded from their traditional position regarding color as an agency of trade marking. There is no question but what the awakened interest of the past few years in all expressions of color in industry has served to quicken and multiply ambitions to establish trade mark monopoly via color. This zest for color franchise has resulted in numerous ingenious attempts to circumvent the limitations upon color. And the latter have brought in their train an unusual number of precedent-making test cases in the U. S. Courts and the tribunals of the U. S. Patent Office. The net result has been to leave unshaken the official conception of the allowable participation of color in trade marking. At the same time, these later official examinations of the subject have served to define more clearly the service which color is capable of rendering in behalf of brand segregation.

As members of the textile industry have good reason to know, the particular problem of trade marking in this age is to attain what might be termed the "divisible" and persistent trade mark which will carry through to ultimate consumers, regardless of units of retail sale or the conversions en route. As a means of providing clues for fractional portions sold from bulk, color has always had an exceptional appeal. Hair-splitting analysis has been necessary to determine the rights of rope and cable manufacturers to trade mark vehicles consisting of distinctively colored strands and cores and, more recently, resource has been shown in the invention of "tape markers," selvage imprints, and "line-in" fabric strands, all depending upon color complexion for consumer recognition.

The attention-arresting quality of color in this color-sensitive age is assuredly a potent factor in the trend to color-marking. Matching this in influence, however, is the consideration that recourse to color renders it easier to do what the average brander most desires to do, viz.: make his trade mark an integral part of the article to be identified. This impulse is by no means confined to textiles and neighboring lines. While Farnsworth Hoyt Company of Boston has its "Red-line-in," and John Hoey & Co., of San Francisco runs a purple seam or cord around the outside of its mattress, behold the National Gypsum Company of Buffalo coloring the edge of its wall board and the Raybestos Company of Bridgeport, Conn., improvising a trade mark by applying a silver-colored coating to one side of sheet packing. While the Pillsbury Flour Mills Company is taking trade mark title to the seam of a flour bag made of alternating white and brown threads, witness the stampede of manufacturers of stoves, ranges, kitchen utensils and housewares to establish in the trade mark role, colored handles, dials, control wheels, etc., in much the same way that pencil and mechanical pen manufacturers have pinned their trade mark faith to arbitrarily-colored caps and bands.

Pointedly illustrative of the continued determination at the U. S. Patent Office not to recognize superior rights in the prior use of naked color are the outcome of a series of recent attempts on the part of oil companies. General Petroleum Company of California failed in an effort to register the color violet as applied to gasoline. Similarly, the Sun Oil Company of Philadelphia was balked when it sought to register the color blue as a gasoline-mark. In deciding appeals in this quarter, the Commissioner of Patents remarked that the public will not give the significance of a trade mark to mere color, no matter whether the color be injected solely for trade mark purposes or for other reasons. He added that liquids, no more than yarns and woven fabrics, are trademarkable in color if there be an attempt to color the article in its entirety instead of expressing the color in some particular design, shape or configuration.

For all the prejudice at Washington against any plot to establish a trade mark monopoly in color as such, the officials have no concern with the standing of a color in the business community provided the color is carried by an acceptable design such as a star, circle, crescent, diamond, bar or ball. That a color is on a coalition color card means nothing to Uncle Sam if the firm or individual who aspires to lean on it as a trade mark has cloaked his intention in a geometrical pattern or symbolic design. It is an open secret at Washington that, just now, the most perplexing phase of trade mark administration as it involves color is to be found in the determination of

what constitutes allowable color span. As has been pointed out, there is an absolute taboo upon mass color—that is to say color that envelops substantially the whole of an article of commerce. On the other hand, it is the common practice to permit registration of a relatively narrow cap, ring or band of color. Covetous trade-markers have been gradually edging up on their prerogatives until it has become a delicate question just where lies the boundary line between mass-color and zone-color. In deciding analytically a recent application for the registration of a "broad band" of color, the head of the Patent Office set up the tenet that "as the color band is widened it may reach such an extent as to become merely a coloring of substantially the whole of the goods and consequently not registerable." Having indicated that there is a twilight zone for color latitudes, the reviewing authority indicated that each individual case of color girth must be decided upon the facts presented.

Spectroscopic Investigation of the Mineral Constituents of Textiles

By **SAMUEL JUDD LEWIS, D.Sc., F.I.C.**

THE mineral constituents of raw materials and finished products in the textile industries are of wide interest and frequently of much significance, but their analytical study by ordinary chemical means is oftentimes troublesome; the common reason being that the quest is for elements either unknown or unsuspected or else for those present in only very small amount distributed over a relatively large quantity of the ordinary inorganic components. Owing to this practical inconvenience there can be no doubt that too little attention has been paid to this subject.

In the various manufacturing processes, inorganic compounds of the most varied type are introduced for a great many purposes, and of these some, such as Soda, Lime, Aluminium, Magnesium and other well-known salts, are presented in very varied qualities, carrying not infrequently impurities which are unsuspected. Other elements are added for various specific purposes in the finishing and dyeing.

From all these considerations, it follows that the analysis of the ash from a sample of fabric may be most enlightening, but that its performance may present many difficulties. It is, for example, by no means easy to detect traces of Aluminium, Zinc, Boron, Chromium, Tin and various other elements, when they occur in only small quantity in company with relatively large quantities of earths. He that hides can find, and he that has seen another hide, knows pretty well where to look. When one knows that Chromium is an element usually associated with a certain dye, one can by special tests find it as often as it is present, but when a mere trace of Chromium occurs under conditions which afford no suggestion of its presence, the element will probably escape detection, save only in an unusually exhaustive analysis. Moreover, when the quantity of material to be examined is very small, great skill and experience in micro-chemistry is called for in order to gain the desired information.

In recent years, the modern quartz spectrograph has proved to be a new weapon for attacking such problems, but its value has been appreciated by comparatively few, although every year enlists new votaries. It has the distinction of being essentially a British instrument; at all events, to the extent of both its invention and development. A Spectrograph is in the main merely an instrument for photographing Spectra, but this added facility enlarges its range of usefulness far beyond that of its more familiar companion, the well-known visual Spectroscope. The Spectrograph is to the Spectroscope what the photographic camera is to the telescope. With the latter, one may make visual observations which depend largely upon the experience and intelligence of the observer, and his capacity for recording; while the former gives a faithful record of all that was to be observed at the moment, available to be examined at any time, either immediately the plate is developed, or in the distant future. One has in the photographed Spectrum the lines indicative of all the elements which were present in the sample, whether suspected or not, and the line may be examined either seriatim or by selection as desired.

The usual experimental procedure is to ash a portion of the specimen of cloth or other substance, and then examine the ash by either the Arc or Spark method according to a routine formula. Details concerning this are given in a useful booklet entitled "The Practice of Spectrum Analysis with Hilger Instruments," published by Messrs. Adam Hilger Ltd., at 1/6. In this booklet, too, will be found a description of the necessary equipment, which may be varied

considerably, but it may consist suitably of a medium sized quartz Spectrograph wherewith to explore the ultra-violet region of the Spectrum as well as the visible region, since in the former lie many of the most sensitive and distinctive lines of the elements.

Some instances of the practical utility of the Spectrographic method will indicate its application to the examination of textiles and related materials.

A Consulting Chemist had submitted to him a piece of cloth bearing a small stain, the identification of which was of some importance, so much so that he placed it in the hands of a Professor; the problem was such as to be difficult of proof by chemical means. After much effort the investigator came to the conclusion that Lead was the essential element in the stain, but further than this, he did not get. In a similar case dealt with spectrographically, far more illuminating results were obtained with a miniature specimen. A piece of thick dark cloth bearing a stain not much larger than a sixpence was quartered, and one portion ashed, and its spectrum observed. Similar observations were made simultaneously with a piece of the unstained cloth of the same size. Not only was Lead found, but also Aluminium and Silicon, which was suggestive of Lead paint containing some Aluminium silicate. Three parts of the specimen remained for further investigation, and evidence of Linseed Oil was obtained, affording with the Spectrographic observations very strong evidence of the stain being due to paint.

Another instance is that of two specimens of cloth very slightly tinted; one was a tweed, the other a striped trouser cloth. It was found that the color was due to the presence of Copper. On ashing a small portion of the stained cloth and a portion of normal cloth, and comparing the Spectra of the ashes, the Copper lines showed very much more strongly in the stained cloth, the Copper in the unstained being extremely feeble, only such as is common in any natural substance. See Fig. 1.

Comparisons were made with two specimens of woolen cloth which had been dipped respectively into solutions of Copper sulphate 1 in 10,000 and 1 in 100,000, by comparison with which it was possible to make a rough estimation of the proportion of Copper present in the tweeds. Provided the quantity is not too large, and under suitable conditions the work may be rendered truly quantitative, usually with as much precision as is possible by gravimetric process. With minute quantities this view is certainly justified, although not fully so with major quantities. The explanation is that with fraction of a milligram the gravimetric experimental error is great, whereas with such quantities the spectrographic method is much more precise than it is with large quantities. Although the cloths were examined primarily for Copper only, it was found incidentally that the tweeds were practically free from Zinc while the trousering contained a small but substantial quantity.

Chemical reactions fail frequently to be as characteristic as one could wish, owing to similarity of reaction between two or three elements and the one reagent. For example, dark brown or black precipitates are obtained by reaction of hydrogen sulphide with Copper, Bismuth, Lead, Tin, etc., and it is not always easy to be quite sure which element is involved. The difficulty is exemplified by some Sodium Salicylate said by one chemist to contain Lead and by another not to do so. The question was settled by reference to the spectrum when it was found that the very slight brown precipitate obtainable by hydrogen sulphide, the whole amounting to only some two parts per million of the salt, was found to consist of Tin with a very small proportion of Lead.

Fig. 1.

Comparison Spectra of the ashes of **Stained Cloth** and **Unstained Cloth.** The ash was placed on Silver electrodes and submitted to the arc spectrum method. The top Copper spectrum serves for comparison only. At scale reading **325** (wave-length **3247.55**), it is seen that the intensity of the Copper line in the stained cloth is some ten times stronger than in the unstained cloth. In the print, although not in the negative, the other strong Copper line is confused with the neighbouring strong Silver line. Several other Copper lines exhibit similar differences of intensity.

Fig. 2.

Spectrograms of the ashes of fabrics dyed with Alizarine Red, S; in the one, Tin has been used, and in the other Chromium and Iron. In each spectrogram, the lines running through both bands are those due to the Copper electrodes, the extra lines in the lower band are significant of the composition of the ash.

An artistic effect may depend on the presence of only a very small quantity of an element, and although it may be ordinarily easily identifiable, it may fail to be so in certain circumstances. Such a case was that of a dress decorative-material, supposed to contain a silver compound, imported from the Continent. Silver served to reproduce the article partially but not satisfactorily. After repeated efforts at manufacture the original material was submitted for spectrographic examination, when Bismuth proved to be the mystic element, and this discovery led to complete success in the works.

Many mordants and dressings contain some metallic element or one of those non-metallic elements such as Boron, Silicon, Phosphorus, Arsenic, which are readily detectable by the ordinary spectroscopic routine, whereby the analysis of these materials is accomplished quite readily.

This is illustrated in the cases represented in Fig. 2. The first spectrogram consists of two bands, the upper being the spectrum of the pure Copper of the electrodes and the lower the combined spectrum of Copper and of the ash of a fabric dyed with Alizarine Red S and Tin. The strong extra lines (Sn.) in the lower band are those of Tin; but there are also recognizable those of other elements contained in the ash of the fabric as indicated. The second spectrogram is a similar example in which Iron and Chromium have been employed.

By a comparison of the two spectrograms it is seen on the most casual observation that the Tin lines are absent from the lower spectrogram and that Iron and Chromium lines are absent from the upper, save only that on closer examination it will be seen that the principal lines of Chromium only are evident and these of slight intensity, whence it follows that a very small quantity of Chromium has been introduced, possibly unwittingly. Calcium lines are very strong in the lower, and very feeble in the upper; so also is Silicon. A little Potassium comes to light in the lower specimen, but none in the upper, a discovery made automatically by Spectrography, but a long and tedious proposition to prove by chemistry; indeed, well nigh impossible with the few milligrams of ash used for the spectra.

Further reference to the subject appears in a paper by the author in the Journal of the Society of Dyers and Colourists, December, 1927.

In summary, it will be seen that the modern Spectrograph is a means for analyzing materials in three senses: (a) General Analysis such as can be readily detected by chemical means; (b) The detection of traces of elements in complex material in cases where chemical analysis is difficult or impossible; (c) The simultaneous ready recognition of the unsuspected element along with those which are familiar. While chemical methods do undoubtedly suffice for most ordinary work, it is well to recognize that other means are called for when some obscure element comes into play, whether that element is well-known or one of the less common. One may explore the whole analysis of a competitor's material, with the confidence that the unsuspected component as well as the more familiar elements will be discovered. Alternatively, if the information is negative, it is none the less valuable, since the avenue of composition being closed, one is prompted to seek some other way which had escaped notice, for example, variation of process.

The word "modern" has been used at the beginning of this paper in describing the instrument. It cannot be urged too strongly that there is the widest possible difference between the results obtainable by means of a small visual Spectroscope, such as is familiar in the ordinary laboratory of a technical school or college, and those obtained with a Quartz Spectrograph of the present day such as that referred to above.—*British Research Association Bulletin.*

Important Trade Directory Again Appears

With the publication of the 1930 Year Book of The Merchants' Association of New York, one of the most valuable trade directories that is published in that city, has again made its appearance.

This book is now being distributed not only to members of The Association, but also to consular officers of the United States wherever they are located, to leading commercial organizations in the United States, and to numerous trade organizations abroad. In all of these quarters a steadily increasing demand for the Year Book has been noted. In addition to the reports covering the activities of The Merchants' Association for the year ended April 30, 1930, the Year Book contains alphabetical and classified lists of the enrollment as of August 23, 1930—a total of more than 7,000 names.

These names represent leading corporations, firms and individuals in their respective fields. The membership is widely diversified, representing virtually every industry and trade in the city and many of the professions.

The alphabetical list of members, together with the classification that has been adopted, makes the volume an ideal book for reference. In the case of firms and corporations, the name of the representative of the concern is shown as well as the name of the company. A brief description of the business is given, and the name of the firm appears both in an alphabetical list and in a list that has been classified according to industry. The membership is classified in 50 large divisions. Twenty-three of these are without subdivisions. Within the other 27 groups are 142 subdivisions, each of the latter representing a distinct trade or profession prominently identified with the commerce and industry of Greater New York. The "Index to Classification" contained in the volume is an alphabetical list of 1,267 commodities, trades, industries, professions, etc., comprising the membership.

Absorption Ratios of Biological Stains

By **W. C. HOLMES**[1] **and A. R. PETERSON**[2]

(Contribution No. 174 from the Color and Farm Waste Division, Bureau of Chemistry and Soils, United States Department of Agriculture, Washington, D. C.)

ABSTRACT—Absorption ratios are supplied for most of the dyes used as biological stains. The use of these ratios will enable the analyst to identify the stains conveniently, and will also frequently afford information of considerable value respecting their purity.

THE term absorption ratio, herein employed, may be defined as the ratio of the extinction coefficients of the solution of a colored substance at two specific wave lengths. If the wave lengths employed are selected on opposite sides of the absorption maximum of the coloring matter, the absorption ratio defines the spectral position of the absorption band.[3] If they are selected on the same side of the maximum, it defines the gradient of the slope of the band within the region of measurements. In either instance the absorption ratio affords a valuable means of differentiating between different dyes, since both the spectral locations of absorption bands and the gradients of their slopes in specific regions are highly characteristic in general, for individual dyes.

It is evident, furthermore, that such ratios are well adapted to reveal the presence of subsidiary coloring matters in dyes and should generally afford a valuable criterion of the relative purity of a dye sample in that respect.

The absorption ratios of about 500 dye samples were measured, including samples of the great majority of dyes which find extensive application in biological staining. The objectives in view were those of obtaining evidence respecting the degree of chemical variation in market supplies of dyes and stains, of establishing standards by which such products may be judged; and of determining in what degree the employment of absorption ratios may be relied upon as a practical means for revealing the relative purity as well as the identity of individual stains.

The standard solvent employed was a mixture of equal volumes of water and 95 per cent alcohol.[4] The principal advantages of this solvent over water are those of inhibiting the deposition of basic dyes on the glass surface of the absorption cells and of preventing the tautomeric alterations which many dyes undergo with changes in dye concentration in aqueous solutions.[5] With this solvent any regulation of dye concentration is unnecessary. In general, sufficient dye was dissolved in about 50 cc. of solvent to afford convenient readings in a half-centimeter layer. In some instances it appeared advisable to render such solutions moderately acid or alkaline, and with a few dyes it was necessary to employ a different solvent.

The measurements were carried out with a direct reading Bausch and Lomb spectrophotometer of the most recent type, equipped with cup and plunger absorption cells in which the solution layers could be regulated rapidly and accurately to insure optimum conditions for all readings. With this convenient instrument it was found possible to determine absorption ratios very rapidly. The entire operation of preparing the solutions and making the photometric measurements need require only a few minutes.

The accuracy with which absorption ratios may be determined varies with the photometric range employed, which may be regulated to conform with optimum conditions for the individual operator, and with the spectral range in which the measurements must be made. Visual sensitivity is greatest near the middle of the visual spectrum and decreases as either end is approached. At the extremes of the working range employed, the authors were usually able to check results within one or two per cent. Elsewhere practically identical ratios were frequently obtained, and the probable error in the determination of the majority of ratios is small.

Absorption ratios for dyes determined in this manner are recorded in Table 1. The solvent denoted therein as "Reg." is the standard solvent previously described. In each instance the absorption ratio (R) is calculated by dividing the extinction obtained at the lower wave length specified by that obtained at the higher wave length.

Of the unindexed dyes tabulated, magenta II is the chloride of triamino phenyl ditolyl carbinol anhydride, synthesized by J. T. Scanlan of this Division. The Cresyl echt violet (Grübler) is of unknown constitution. The samples examined are representative of the product which the Grübler Company now supplies for biological staining, and appear to be identical with the dye marketed by Leonhardt. The American stain, Cresyl violet (NAC), is aminonaphtho-dimethylamino-tolazoxonium chloride.

Methylene violet (Bernthsen) is dimethyl thionolin. Fast green FCF is the p-hydroxy analog of Erioglaucine A (C. I. 671).

Of the comparatively few stains omitted from the table no samples were available in some instances. In others as, for example, the less completely substituted types of Erythrosin, Phloxine, and Rose bengal, the available samples were of such a divergent character that no reliable conclusion could be reached respecting their normal characteristics. Only two dyes were encountered, Picric acid and Narcein, which proved unsuited for examination within the spectral range in which it was considered practical to undertake visual measurements.

Some of the recorded ratios doubtless differ, in a minor degree from correct ratios for the pure dyes. The value given for Methylene blue, for example, is slightly higher than the corresponding value for pure Methylene blue. The recorded values are intended to be representative of market products and, in general, of the purest grades of such products. They will be used as provisional working standards for the future examinations of the stains in question. In general they may be accepted as reliable, although it may eventually prove advisable to revise in a minor degree the values given for Eosin B, Nile blue A, Methylene green, and a few other dyes of which the available samples were of a somewhat diverse character.

A comparison of results obtained with different samples of individual dyes indicates essential uniformity in market supplies of most stains, but considerable diversity in some instances. Values obtained with Acid fuchsins, for example, ranged between .75 and .95. The recorded value for this dye (.81) was obtained with a Sulfonated rosanilin, prepared by J. T. Scanlan of this Division, which has proved exceptionally satisfactory in practical staining application. In other instances of dyes known to be mixtures, such as ordinary Basic fuchsin, Safranin, and Methyl violet, the products of different manufacturers proved surprisingly uniform. Examples of dyes of supposedly homogeneous type which proved variable were found in most of the dye groups, but more frequently, perhaps, in the phthalein and oxazin groups than elsewhere.

In view of such variations it is obvious that the identification of stains by means of their absorption ratios necessitates the exercise of discretion. Abnormal samples may frequently be encountered which give somewhat different values from those recorded. It will probably be but seldom, however, that such samples will contain sufficient proportions of subsidiary coloring matters to obscure seriously the identity of their principal component.

In general the ratios are less reliable for most yellow, orange, and brown stains than for those of other colors, because the gradient of the slope of an absorption band is less characteristic than its spectral location. They are less characteristic for azo dyes than for the dyes of other classes because their bands are broader and less well-defined.

With these qualifications, and with the proviso that it may sometimes prove advisable to resort to other methods for corroboratory evidence, the absorption ratio may be advocated as an extremely convenient and valuable means for identifying stains. The recorded values for Chrysoidin Y and R, Pararosanilin, and Rosanilin, Crystal and Benzyl violets, and Methylene and Thionin blues, for example, illustrate how decisively they may enable the analyst to distinguish between very similar dyes which may be differentiated by other means only with extreme difficulty or considerable labor.

In connection with this application of absorption ratios it was considered advisable to investigate with considerable care the possible influence of the salt-forming radical associated with the dye. It has been shown[6] that the color and absorption of various metallic salts of polyhydroxy anthraquinone dyes are decidedly different, and the senior author has observed analogous variations with metallic salts of direct azo dyes. Some biological stains are marketed in different forms; basic dyes, in particular, appearing as salts of different acids. In order to determine whether the absorption ratios might differ in such instances, a considerable variety of different salts of the same dyes were compared. The most comprehensive tests were carried out with Rosanilin, of which the nitrate, sulfate, acetate, iodide, borate, citrate, bromide, benzoate, oxalate, chloride and resorcin addition products were prepared and examined. All of the ratios with this series ranged between .88 and .90. The conclusion was reached that the influence of the salt-forming radical is entirely negligible in any form of product in which stains are likely to be marketed.

The value of absorption ratios as a criterion of dye purity was also demonstrated conclusively. In the technic followed in obtaining the recorded values, this aspect of the matter was given less consideration than that of dye identification, and it is probable that the conditions employed in some instances were not equally suitable for both purposes. This was shown to be true with Indigotin. The fact that a sample of the dye which was known to be somewhat abnormal proved indistinguishable from normal samples when examined in the standard solvent led to further investigation. It was found that the mono-, di-, tri- and tetrasulfonates of Indigo gave ratios, respectively, of .76, .78, .90, and 1.39 under those conditions. It is obvious, accordingly, that the presence of the lower sulfonate in Indigotin would escape detection in the solvent specified, although the presence of appreciable proportions of higher sulfonates would be apparent. Since the lower sulfonate is the principal impurity found in commercial samples of Indigotin, the determination of the absorption ratio under these conditions affords no adequate criterion of dye purity. It was found, however, that the ratio values of the di- and monosulfonates were, respectively, .84 and 1.36 when the same wave lengths were employed and the dyes dissolved in 80 per cent alcohol, and it is evident that the presence of relatively small proportions of the lower sulfonate in Indigotin will be apparent if the dye is examined in the latter solvent.

Although it is probable that the wave lengths, solvents

and other conditions employed in obtaining the recorded absorption ratios are not always exceptionally well-adapted for the determination of dye purity, it is evident that they are in general relatively adequate for that purpose. It has been shown[7] that a ratio of the same type may be used in determining the purity of Methylene blue within relatively narrow limits, and the decided variations in recorded values for related dyes indicate that such values may frequently afford a roughly quantitative, rather than merely qualitative, measure of subsidiary dyes which may be present in impure dye samples. Dibromo fluorescein, for example, gives a value of 3.82 under the same conditions in which ordinary Eosin gives a ratio of .92, and the ratio plainly affords a very satisfactory means of determining the degree of under-bromination which may be found in eosins. Even greater differences between dyes and the subsidiary coloring matters with which they are associated are not uncommon. Crystal violet gives a value of approximately 11.3 when examined under the conditions employed in testing Methyl green, which gives a value of .90. The oxazones which appear to be invariably present in oxazin dyes differ in color in a very considerable degree from the dyes which they contaminate.

Absorption ratios, accordingly, supply a remarkably convenient means for establishing the identity of stains, in general, and for determining the degree of purity of many stains in as definite a degree as is ordinarily necessary or desirable.

[1]Senior Chemist, Color and Farm Waste Division, Bureau of Chemistry and Soils, Washington, D. C.

[2]Research Associate, Commission on Standardization of Biological Stains.

[3]W. C. Holmes. Spectrophotometric identification of dyes. III. Basic violets of the triphenyl-methane group. Ind. & Eng. Chem. 17, 918, 1925.

[4]W. C. Holmes. The choice of solvent in spectrophotometric dye analysis. Am. Dyestuff Reporter, April, 1926.

[5]W. C. Holmes. The influence of variation in concentration on the absorption spectra of dye solutions. Ind. & Eng. Chem. 16, 35, 1924.

[6]D. B. Meek and E. R. Watson. The color of polyhydroxyanthraquinone dyes. J. Chem Soc. (London) 109 (2), 544. 1916.

[7]W. C. Holmes. The spectrophotometric evaluation of mixtures of methylene blue and trimethyl thionin. Stain Techn. 3, 45, 1928.

TABLE 1

Dye	C. I No.	Solvent	Wave Lengths: (mμ)	R
Fluorescein, Na salt	766	Reg. + 5 drops 1% Na_2CO_3	500, 530	36.5
Auramin	655	Reg.	500, 530	30.0
Martius yellow	9	Reg.	500, 530	14.8
Orange G	27	Reg.	500, 530	5.24
Resorcin yellow	148	Reg.	500, 530	3.61
Chrysoidin Y	20	Reg.	500, 530	2.83
Chrysoidin R	21	Reg.	500, 530	2.63
Sudan I	24	95% alcohol	500, 530	2.49
Diamond flavine	110	Reg.	500, 530	2.45
Orange II	151	Reg.	500, 530	1.95
Bismark brown Y	331	Reg.	500, 530	1.88
Orange IV	143	Reg. + 10 drops 6N. HCI	500, 530	1.75
Bismark brown R	332	Reg.	500, 530	1.58
Sudan II	73	95% alcohol	500, 530	1.26
Congo red	370	Reg.	500, 530	1.23
Purpurin 4 B	448	Reg.	500, 530	1.19
Vital red	456	Reg.	500, 530	1.17
Sudan III	248	95% alcohol	500, 530	1.11
Crystal ponceau	89	Reg.	500, 530	1.04
Biebrich scarlet	280	Reg.	500, 530	1.00
Orange I	150	1% Na_2CO_3	500, 530	1.00
Sudan IV	258	95% alcohol	500, 530	0.97
Fast red A	176	Reg.	500, 530	0.97
Methyl orange	142	Reg. + 10 drops 6N. HCI	500, 530	0.97
Bordeaux B	88	Reg.	500, 530	0.88
Dibromofluorescein	—	Reg. + 5 drops 1% Na_2CO_3	505, 535	3.84
Mercurochrome	—	Reg. + 5 drops 1% Na_2CO_3	505, 535	2.83
Eosin	768	Reg. + 5 drops 1% Na_2CO_3	505, 535	0.92
Janus red	266	Reg.	510, 540	1.12
Amaranth	184	Reg.	510, 540	1.07
Eosin B	771	Reg. + 5 drops 1% Na_2CO_3	515, 545	1.41
Phenosafranin	840	Reg.	515, 545	1.13
Erythrosin	773	Reg. + 5 drops 1% Na_2CO_3	515, 545	1.04

Safranin	841	Reg.	515, 545	1.02
Phloxine B	778	Reg. + 5 drops 1% Na_2CO_3	515, 545	0.97
Methyl eosin	769	Reg. + 5 drops 1% Na_2CO_3	515, 545	0.96
Ethyl eosin	770	Reg. + 5 drops 1% Na_2CO_3	515, 545	0.86
Neutral red	825	Reg. + 5 drops glac. acetic acid	515, 545	0.75
Methylene violet 2 R	842	Reg.	515, 545	0.61
Rhodamin S	743	Reg.	530, 560	1.51
Para rosanilin	676	Reg.	530, 560	1.13
Neutral violet	826	Reg. + 5 drops glac. acetic acid	530, 560	1.05
Magenta II	—	Reg.	530, 560	0.96
Rosanilin	—	Reg.	530, 560	0.89
Acid fuchsin	692	Reg.	530, 560	0.81
Rhodamin G	750	Reg.	530, 560	0.78
Pyronin G	739	Reg.	530, 560	0.775
New fuchsin	678	Reg.	530, 560	0.755
Rhodamin B	749	Reg.	530, 560	0.58
Pyronin B	741	Reg.	530, 560	0.52
Rose bengal 3 B	779	Reg. + 5 drops 1% Na_2CO_3	540, 570	0.92
Alizarin red S	1034	N. NaOH	545, 575	1.21
Alizarin	1027	N. NaOH	545, 575	0.81
Chrome black F	299	Reg.	545, 575	0.94
Magdala red	857	Reg.	545, 575	0.90
Meldola's blue	909	Reg.	560, 590	1.13
Methyl violet	680	Reg.	575, 605	1.405
Iris violet	847	Reg.	575, 605	1.29
Benzyl violet	683	Reg.	575, 605	1.14
Anilin blue (s. sol.)	689	Reg.	575, 605	1.08
Crystal violet	681	Reg.	575, 605	1.065
Nigrosin (w. sol.)	865	Reg.	575, 605	1.01
Ethyl violet	682	Reg.	575, 605	0.91
Thionin	920	Reg.	590, 620	1.44
Cresyl echt violet (Gr.)	—	Reg.	590, 620	1.20
Anilin blue (w. sol.)	707	Reg.	590, 620	1.08
Trypan blue	477	Reg.	590, 620	1.08
Niagara sky blue	520	Reg.	590, 620	0.99
Methyl blue	706	Reg.	590, 620	0.97
Methylene violet (Bernthsen)	—	Reg.	590, 620	0.835
Indigotin	1180	Reg.	590, 620	0.79
Victoria blue B	729	Reg.	605, 635	1.18
Night blue	731	Reg.	605, 635	1.04
Brilliant cresyl blue	877	Reg.	605, 635	0.90
Malachite green	657	Reg.	605, 635	0.83
Fast green FCF	—	Reg.	605, 635	0.76
Guinea green B	666	Reg.	605, 635	0.715
Brilliant green	662	Reg.	620, 650	1.51
New methylene blue N	927	Reg.	620, 650	1.21
Cresyl violet (NAC)	—	Reg.	620, 650	1.16
Toluidine blue O	925	Reg.	620, 650	1.04
Light green SFY	670	Reg.	620, 650	0.98
Nile blue A	913	Reg.	620, 650	0.90
Methyl green	684	Reg.	620, 650	0.90
Methylene green	924	Reg.	635, 665	1.12
Janus green	133	Reg.	635, 665	0.97
Nile blue BB	914	Reg.	635, 665	0.93
Methylene blue	922	Reg.	635, 665	0.59
Thionin blue	926	Reg.	635, 665	0.51
Capri blue GON	876	Reg.	650, 680	1.27

—*Stain Technology*

Technical Notes from Foreign Sources

Colloid Chemistry of Washing Agents

Dr. L. Zakarias—Monatsch. f. Textil-Ind. 45, 120 (1930)—The first part of an exhaustive paper on the subject cited, from the standpoint of physical chemistry, with copious references to researches of other workers in the field. This section comprises two general topics, the physico-chemical evaluation of soaps, and the additions which are made to common "pure" soaps for special purposes.

Two interesting points discussed are worth mention. One is, that the addition of polysaccharides (some of them, at least) to a soap solution greatly increases its power of forming a good "suds", and exercises a protective-colloid action which is about 30-40 times as great as that of the soap itself. The other point has already been referred to in these columns; namely, that soaps containing fat-solvents in addition do not show any greater effectiveness than the soap itself does, alone, in removing oily or greasy matter from a textile material. This fact, Z. states, is more than conceded by laundry workers, but, strangely enough, such soaps in strong baths are greatly valued in the industry for cleansing very oily or greasy goods, in which cases the ordinary soaps are hardly effective at all. The scientific explanation of this fact is still lacking.

The second section of the paper continues on p. 253 (1 c.), taking up the two further topics of simultaneous softening of water, and washing, and the soap-free method of washing (this phrase must not be misunderstood).

Under the first of these two topics, the author discusses two new methods for determining the stability of washing agents toward calcium compounds, through which what he calls the relative and the absolute stability can be established. Fat-solvents, sulphonated oils, wetting-out agents, and even those soaps which contain polysaccharides or soda, are not absolutely stable toward calcium compounds, for they are either finely or coarsely dispersively flocculated in hard water. Only a few water-soluble wetting-out agents and the sulphonated oils flocculate in the finely dispersed state, which accounts for the belief that they form no insoluble precipitates upon the goods when used for washing with hard water. Such substances the author calls relatively stable toward lime. Certain polysaccharides, however, are absolutely stable, for they do not flocculate in ordinary hard water of 20°-40° hardness. Information can be obtained regarding conditions by parallel tests,—by adding to the same amount of hard water, hot, successive portions of soaps, sulphonated oils, fat-solvents emulsified in water, and wetting-out agents, until 0.5 per cent of palm-oil soap will foam in the mixture. It is astonishing how much soap the hard water uses up, before the water will form a good suds. As long as suds do not form, the soap, of course, will not cleanse.

In softening water with polysaccharides, at least 0.08 per cent of soap must be taken as a check, for the polysaccharides, used in large amounts, suppress the formation of suds.

Because of their very poor protective-colloid action, soaps are in general extremely poor washing agents, in reference to their sensitivity toward the lime compounds found in hard water.

In regard to the use of polysaccharides, the author has found that certain preparations (commercial) based upon them will both soften hard water, and act as washing agents at the same time (with no soap). Thus, 100 liters of water of 23° hardness, with 1 kilo of one preparation (Wasch-Physiol), becomes so soft that an 0.08 per cent soap solution gives a good suds in it. Since this preparation contains only 10-11 per cent of solid, according to analytical figures, 0.1 per cent of the substance is sufficient for softening the water and for cleansing. If soap is used in conjunction with such a substance, the necessary amount of the latter is first added to soften the water, and then the bath warmed to 50°-60° C. before adding the soap. Also, instead of soap we may use one of the common fat-solvents, as trichlor-ethylene, in which case the solvent is added to the preparation, and the mixture then added to the bath.

The second topic, the soap-free method of washing, is concerned entirely with a comparison of ordinary soap-washing methods and the new method involving the above-mentioned preparation "Physiol".

Azo Dyestuffs

German Patent No. 450,720 — *IMCA. Farben-Ind. A.-G.* (22, IX, 1927)—The nucelus of the products concerned is formed by mono-azo dyestuffs produced by coupling diazotized o-amino-benzaldehyde to any desired second component. Such products of themselves are unstable because of the free aldehyde group, being easily oxidized by the air. If such products are reacted with hydroxylamine (presumably only ordinary oximes are formed), the resulting compounds are completely stable, and by virtue of the oxime group can be easily converted into stable metallic derivatives. Five examples give the preparation of dyestuffs dyeing wool yellowish brown, bordeaux (after-coppering blue), and pure yellow, and dyeing cotton a deep bordeaux (after-coppering a fine violet, very fast to light and washing), and clear red (which becomes brownish-red on after-coppering).

The Dyestuff Industry in Italy

Edoardo Colli—Boll. Assn. Ital. Chim. Tess. e Colorist. 6, 91 (1930)—A seven-page résumé of the present dyestuff situation in Italy, from which it appears that the industry is doing its best, and creditably, to take care of the demands of the Italian dyers, at least as far as staple products are concerned.

The Rota Method for Analysis (Recognition) of Dyestuffs

Dr. Osiris Bizioli—Boll. Assn. Ital. Chem. Tess. e Colorist. 6, 98 (1930)—A paper of historical nature, claiming for Prof. Rota, an Italian dye-chemist of the last generation, credit for valuable work along the line of analysis or determination of dyestuffs, which has not received the recognition due it. His method was based primarily upon the grouping of dyestuffs according to the effect upon them of stannous chloride (reduction) and of ferric chloride (oxidation).

Photo-Micrography as an Aid to Design

H. Ellis—Text. Merc. 82, 489 (1930)—A short description, illustrated, of a method (not new, to be sure) for producing photo-micrographs with compound microscope and an ordinary bellows camera (ground glass type). A few hints are given toward securing success in practice. The point of the paper lies in its showing the ease with which fair photo-micrographs, at least, may be turned out with simple apparatus, and the suggestion that many such photographs offer valuable hints for motifs in designing.

Azo Pigments

German Patent No. 450,996.—*I. G. Farben-Ind. A.-G.* (29, IX, 1927)—The coloring matters are azo derivatives of the Naphthol AS series, produced by coupling the diazo derivatives of 4-nitro-2-amino-benzoic acid to various derivatives of 2-hydroxy-3-naphthoic acid, as the amides, aryl, and aralkyl-amides. The products are claimed to stand high in brilliancy of tone and fastness to light.

Azo Pigments

German Patent No. 450,919 (*addition to German Patent No.* 430,581 *of* 1924)—*I. G. Farben-Ind. A.-G.* (29, IX, 1927)—The second or passive component is formed by the arylides of 2-hydroxy-3-naphthoic acid (Naphthol AS series). In the original patent, the first components proposed were 2-amino-4-aroylamino-1-alkylhydroxy—or aralkylhydroxy-benzene, containing no free hydroxyl, sulpho, or carboxyl group; which were diazotized and coupled to the Naphthol AS compound. In this present addition to the original, the alkylhydroxy—or aralkylhydroxy-group may be replaced by an arylhydroxy group. The coupling product may be produced in substance upon a suitable substratum, as an ordinary pigment, or formed upon the fiber as usual for the Naphthol AS series.

Dyeing of Cellulose Ethers

German Patent No. 453,215 (*addition to G. P. No.* 438,378 *of* 1922)—*I. G. Farben-Ind. A.-G.* (17, XI, 1927)—The original patent covers the dyeing of cellulose acetate with basic, acid, or other dyestuffs, by addition of ammonium salts to the bath. Bases also, which are to be afterward diazotized and developed upon the fiber, take well upon the material in such a bath. This patent merely extends the principle to cellulose ethers. The procedure also covers the mixed materials which contain these cellulose derivatives.

Four examples are given, employing benzyl-cellulose. E. g., 1 kilo of benzyl-cellulose is entered at 50° C. into a bath of 20-25 liters, containing in solution 30 g. of dianisidine hydrochloride and 300 g. of ammonium sulphate. The bath is slowly warmed, and the material worked for ¾ hour at 70°-75°, then diazotized as usual in a fresh bath, and in a third bath developed with resorcinol, finally rinsed, and dried. It is best to work in any case well below the boiling-point.

Sulphur Dyestuffs

German Patent No. 450,864 (*addition to G. P. No.* 432,177 *of* 1922)—*Kalle and Co.* (29, IX, 1927)—The original patent covers the fusion of substituted amines, excluding amino-carbazoles, with dihydroxy-compounds, under pressure, with sulphurizing agents. Thus, Vidal melted p-phenylene-diamine with hydroquinone and sulphur, obtaining the technically useless "Thionoline". By including the amino-carbazoles within the scope of this reaction, the present patent covers a substantial Thionoline of much better fastness to chlorine, for example, than the original.

Instead of amines already existing as such, compounds may be used which go over to amines in the sulphur fusion; nitro-compounds, and certain azo-compounds, for example. Solvents of any kind may be employed in the reaction, if desired.

Agent for Fixing Basic Dyestuffs

German Patent No. 432,113—*I. G. Farben-Ind. A.-G.*—By oxidation of phenols, their homologues, or derivatives, with certain oxidizing agents, weakly-colored or colorless alkali-soluble compounds are formed, apparently consisting of poly-hydroxy-poly-phenols. They are taken up by cotton, etc., without coloring the fiber, and possess the property of fixing basic dyestuffs when the pretreated goods are dyed with such dyestuffs (Cf. "Kantanol").

Technical Improvements in Italian Artificial Silk Industry

Dr. Albert Sander—Kunst-Seide 11, 112 (1929).—The paper takes up in some detail a method worked out in Italy for the regeneration of the precipitating bath. One diagrammatic illustration is given. It is stated that a saving of 5-6% of the total cost of production is accomplished.

Dyeing of Acetate Silk; Its Light-Fastness

H. Brandenburger—Kunst-Seide 12, 223 (1930).—Interesting and valuable—a paper of exact technique. The author begins with a number of statements of the conditions relating to the subject, discusses then the methods used in his study, and ends with an extensive table of results gained, a table which would seem, at least, to evaluate most of the dyestuffs now used or usable upon acetate silk, according to their fastness to light. Reference, of course is made to the German standards of fastness, of the Echtheitskommission.

The subject is of great practical importance, of course, since at the present time silks and artificial silks are worn, not only in the evening, as once, but by day as well, especially for summer wear, in which the goods are exposed to actual sunlight as opposed to merely "light," one might say. In the study under consideration, regard was directed (a) to uniform irradiation, and (b) to a uniform method of comparison between different tests. As to the first, the best method seemed to be that of ordinary daylight exposure under glass, but with exposure to atmospheric changes in humidity also, the duration of irradiation being determined by use of the Krais light-hour method (standard Victoria Blue B paper). A total of 55 light-hours was taken as the standard, this being equivalent, in the author's opinion, to the wearing of a garment for 30-35 days, exposed to the sun for seven hours per day (the author mildly intimates that such a period may well serve as a maximum, when the factors of Woman and Style are considered).

Ziersch's formula (derived from use of a modern step-photometer) is held to be inapplicable here, and Brandenburger's estimates of light-fastness are in accord with the older standards of the German Fastness-Commission. He comments upon the fact that the Fastness-Commission standards for acetate silk number only five, while eight are laid down for cotton, and expresses the wish that in a future revision the number of standards may be made uniform.

Almost all brands of acetate silk available were tested.

In considering the results as shown in the copious table, B. comments upon the poor fastness of ice colors as compared, e.g., to the "self," i.e., the directly dyed colors. Suspension dyestuffs, which are mostly based upon amino-anthraquinones, are also decidedly fast. He promises forthcoming discussion of the matter, from the theoretical side.

Olein as a Crude for Textile Soaps

W. Rotta—Monatsch. f. Textil-Ind. 45, 124 (1930).—In a recent number of the above Journal (the January 1930 number) there appeared an interesting article upon "Textile Soap Problems," by R. Manschke. The portion relating to the suitability of olein for the preparation of textile soaps is, however, so worded as possibly to produce incorrect impressions, to obviate which is the purpose of the following note:—

It is true that many crude substances are dealt with, under the name ot olein, which do not deserve the name. The special literature of recent years has often dealt with this topic; attention may be called to the valuable papers of Stadlinger, for example. Not only oleins with a much too high content of unsaponifiable matter and neutral fat have been studied analytically, but also products containing considerable additions of vegetable fatty acids, fatty acids of marine origin, and other incidentally related substances. In the effort to offer attractive prices to the trade, various firms have brought badly adulterated products upon the market; there has been no lack of buyers, who have been elated without reason over the cheap raw materials secured by them for their unfortunate concerns. It must be emphasized, however, that well-known firms put out unimpeachable oleins of high quality; oleins which have been used for a considerable number of years for the production of textile soaps, and with most satisfactory results. These soaps have shown their value for the washing of raw weaves as well as in the washing of raw wool.

The standard methods of analysis for oleins have been established by experts, and are currently employed in the industry, so that a perfectly satisfactory testing of a commercial olein would easily be possible. Firms which do not employ chemists in their plants can have their crude materials analyzed by any chemical institute, and the cost of this is more than repaid by results.

The exhaustive saponification of oleins cannot be carried out without the use of special apparatus. There is no difficulty in getting a soap technically neutral, if indicators of sufficient sensitivity are available. The manufacture of one's own soap is profitable, however, only for such textile plants as require so much that they would need to buy in olein in large quantities.

Naphthol Red Dyeings—Fastness to Rubbing

Monatsch. f. Textil-Ind. 45, 133 (1930). — In the Question-Answer section of the above Journal appears a query as to attaining complete fastness to rubbing, with the red produced from Naphthol AS-TR and Fast Red TR Base. Five answers are given by different workers, and a summary of them is not without interest. One correspondent advises the use of a "brushing jig" manufactured by the Zittauer Maschinenfabrik, which gives dyeings fast to rubbing by simply rubbing off what will rub off (!), the result being obviously fast to rubbing, since the merely adherent dyestuff has already been rubbed off. Other correspondents stress the need of the developer-bath being absolutely free from acid, good soaping at the boil, rinsing with a caustic-common salt bath between padding and developing, soft water in the preparation of the padding bath, and the use of various wetting-out agents, as well as of protective colloids when hard water must be used. Each answer is evidently based upon the experience of the worker's own difficulty and his mode of removing it; but apparently the only general conclusion to be drawn from the answers collectively is the old lesson—to do everything correctly from start to finish. if satisfactory results are desired.

LOUIS B. FORTNER

Louis B. Fortner, head of the L. B. Fortner Co., dyestuff manufacturers, died suddenly on October 14th of heart disease.

Mr. Fortner had been prominent in the dye industry for many years. He received his early sales training with N. Spencer Thomas of Boston. In 1899 he went into business with Walter B. Keene under the firm name, Fortner & Keene. He continued the business under his own name after the death of Mr. Keene in 1900.

Potassium Abietate

Potassium Abietate is now being produced by the Glyco Products Co. of Bush Terminal, Brooklyn, N. Y. Potassium Abietate is classed chemically as a soap and is marketed with as low a moisture content as 15 per cent. It is a reddish brown highly viscous paste readily soluble in cold water. It is claimed to be suitable in place of rosin soaps which must now be made by heat under rigid control. Since rosin soaps are widely used in preparing emulsions for cleansers and textile lubricants, it is said to relieve the manufacturers of these products of much detail and enables them to obtain a standardized product which will produce uniform results.

It is a convenient starting point for the preparation of pure precipitated resinates for use as dryers, sizes and waterproofings. The company states that its low cost in quantity makes it the cheapest soap available for these and other varied uses. Formulae and other data are furnished by the manufacturer.

New Product of Campbell

Permeko, a new wetting-out agent, manufactured by John Campbell & Co., is said to possess extraordinary properties pertaining to the wetting-out, bleaching, stripping and dyeing of all kinds of textile materials.

Permeko is an organic compound—neutral in character, a wetting-out agent, penetrant, dispersing agent, emulsifier, and is classified as a leveling assistant in the dyeing operations.

Due to its dispersing and emulsifying action, the company states that it dissolves all the natural films and protecting oils, removing them quickly with the result that the material is wet out in less than one-half the time required with water alone.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Young man desires position in New England. At present working in dyestuff laboratory. Two years' dye house experience, also two years at Lowell Textile School. References. Address: Classified Box No. 647, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

CHEMIST-EXECUTIVE AVAILABLE

Textile Chemist with twenty-two years' practical experience. Graduate Lowell Textile Institute. Four years instructor in Chemistry and Dyeing. Three years theoretical and practical experience in Peroxide Bleaching. Fifteen years in charge of chemical work in large textile plant. Experienced in purchase of dyes and chemicals. Excellent analyst, and one who can interpret results.

Would consider position as technical advisor to chemical or dyestuff executive. Address: Classified Box No. 638, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Textile Colorist, 13 years' experience in dyeing, calico printing, and standardization, wishes to make change. Preferably with dyestuff manufacturing concern: Address: Classified Box No. 639, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Textile Chemist and Colorist, age 25, graduate of prominent Eastern textile school — desires position in dyeing or silk printing establishment, where initiative and ambition will be recognized. Address Classified Box No. 646, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Colorist, thirty, married, twelve years' experience in laboratory of dyestuff manufacturer, doing standardizing, shade matching, and demonstrating; desires position in dyestuff manufacturer's laboratory or in a mill. Address Classified Box No. 645, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Dyer, Worsted and Woolen—technically trained man wishes to make a change about January 1st. Progressive and excellent color matcher. Has successfully managed several dye houses for a number of years, and can furnish excellent references confirming the above statement. Address Classified Box No. 644, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.